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IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES

Versar, Incorporated

PREPARED FOR
Environmental Protection Agency

April 1975

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IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES

APRIL 1975

FINAL REPORT

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TOXIC SUBSTANCES
WASHINGTON, D. C. 20460

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16. ABSTRACT

Initial assessment of the possible sources of 154 organic compounds which have been identified in drinking water supplies. List those chemicals which may be formed by chlorination of sewage treatment or water treatment, from leachates from natural sources, and those which may be from industrial effluents. Appendix C has a data sheet for each chemical which shows possible sources, its biodegradability and effective treatment.

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"IDENTIFICATION OF ORGANIC COMPOUNDS IN EFFLUENTS FROM INDUSTRIAL SOURCES"

FINAL REPORT

Contract No. 68-01-2926
Task 3

Prepared For:

Environmental Protection Agency
Office of Toxic Substances
Waterside Mall
Washington, D.C. 20460

April, 1975

FOREWORD

This report presents the results of a six-week technical effort by the General Technologies Division (GTD) of Versar, Inc., Springfield, Virginia, under Task III of EPA Contract No. 68-01-2926. It was administered under the direction of the Special Projects Branch, Office of Toxic Substances, Environmental Protection Agency, Waterside Mall, Washington, D.C., with David Garrett, P.E., and Herbert Katz, Ph.D., as Project Monitors.

The Program Manager at GTD was Edwin F. Abrams. The Principal Investigator was Karen M. Slimak. They were assisted by Daniel L. Derkics, Deborah K. Guinan, and Chih-Chia V. Fong.

This report has been reviewed by the Office of Toxic Substances, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
2.0	SUMMARY	2-1
3.0	RECOMMENDATIONS	3-1
	3.1 Proposed Program Plan	3-1
	3.2 Recommended Plan Implementation	3-5
4.0	TECHNICAL APPROACH AND RESULTS	4-1
	4.1 Technical Approach	4-1
	4.1.1 Data Collection and Assimilation	4-1
	4.1.2 Estimations of Annual Industrial Water-borne Discharges for Specific Organics	4-1
	4.1.3 Chemical Reactions	4-5
	4.1.4 Biodegradability (Persistence)	4-5
	4.1.5 Data Display	4-6
	4.2 Categorizations	4-6
	4.3 Discussion of Results	4-32
	4.3.1 Compounds Not Industrially Manufactured	4-32
	4.3.2 Compounds Which May Be Formed During Chlorination	4-34
	4.3.3 Compounds Formed During Sewage Treatment	4-35
	4.3.4 Organic Compounds as Refractory Human Metabolites	4-37
	4.3.5 Landfill Leachate	4-37
	4.3.6 Typical Chemical Reactions in Air and Water	4-38
	4.3.7 Biodegradability	4-38
APPENDIX A	Organic Compounds Identified in Drinking Waters in The U.S. (as of 11/25/74), EPA, Cincinnati, Ohio	A-1
APPENDIX B	Bibliography	B-1
APPENDIX C	Data Display	C-1
APPENDIX D	The Nationwide Occurrence of Organic Compounds Identified in Drinking Water	D-1

LIST OF FIGURES

Figure		Page
3.1	Schematic Diagram of Proposed Scope of Work	3-3
3.2	Proposed Program Schedule	3-6

LIST OF TABLES

Table No.		Page
4.1.1	Biodegradability (Persistence) Categories	4-5
4.2.1	Categorization by Chemical Class	4-8
4.2.2	Categorization by Manufacturing Method	4-14
4.2.3	Categorization by Probable Manufacturing SIC Industry Point Source	4-19
4.3.1	A. Organics With No Specific Industrial Manufacture or Use	4-33
	B. Possible Chlorinated Derivatives of Industrial Compounds	4-33
4.3.2	Compounds Which May Be Formed by Chlorination. . . .	4-34
4.3.3	Starting Compounds and Possible Resultant Clorination Products (MCA, 1972)	4-35
4.3.4	Compounds Which May Be Formed During the Biological Phase of Sewage Treatment	4-36
4.3.5	Compounds Positively Identified in Sewage Treatment Plant Effluents	4-36
4.3.6	Organic Compounds Identified in Landfill Leachate . . .	4-37
4.3.7	Biodegradability of Organics Identified in Drinking Water	4-40

1.0 INTRODUCTION

Studies at the EPA research laboratories in Cincinnati identified over 150 organic compounds in drinking water supplies of communities on the Ohio, Potomac and Mississippi Rivers (see Appendix A). The Special Projects Branch, Office of Toxic Substances, EPA, in Washington, D.C. initiated this project to identify the types of industrial facilities known or suspected of discharging any of the identified organic compounds. After these possible industrial sources are identified, gross annual discharge estimates of the waterborne compounds are to be made along with the persistency of these chemicals to remain intact through possible treatment systems and thereby reach drinking water supplies.

Along with the industrial sector, possible water and airborne natural sources, agricultural sources and other non-point sources are also to be identified without quantification.

After performing these tasks, a plan is to be formulated to attack the overall problem of specifically identifying, quantifying, monitoring and eventually eliminating this threat from industrial and other sources as realistically as possible within a two-year period.

From recent EPA analyses of drinking water in various communities, there is convincing evidence that carcinogens and potentially carcinogenic and/or toxic organic compounds are present as contaminants.

Industrial sources which have been identified as sources of certain chemical carcinogenic substances by the National Cancer Institute include:

Petroleum Products

Petroleum refinery wastes containing polycyclic aromatic hydrocarbons; fuel oils, lubricating oils and cutting oils from garages, service stations, petrochemical plants, metalworking plants, ships; products used as vehicles of insecticide sprays; tarred or asphalted roads.

Coal Tar

Effluents from gas plants, coke oven operations, tar distilleries, tar-paper plants, wood pickling plants.

Aromatic Amino- and Nitro- Compounds

Amino compounds and their nitro-analogs are released by dye and rubber manufacturing, pharmaceutical factories, textile dyeing plants, plastics production, and others.

Pesticides, Herbicides, Soil Sterilants

Compounds such as DDT, dieldrin, carbon tetrachloride and many others are released by pesticide manufacturers. The majority of pesticides, herbicides, and soil fumigants in water arises from agricultural and urban runoff.

In addition to industrial wastes, discharges from domestic treatment plants may also be responsible for a variety of chlorinated organic compounds found in water. Similarly, chlorination of polluted river water has been found to produce compounds such as chloroform, dichlorobromomethane and other halomethanes and haloethanes.

Intermittent problem sources are spills and accidents from industrial operations, barge traffic, or other transport vessels.

Thus, it can be concluded that public drinking water supplies may be routinely contaminated with carcinogenic and potentially carcinogenic substances from industrial and municipal discharges, accidental spills, runoff from agricultural and urban areas, and from the chlorination process at water treatment plants.

This program represents a short duration study of available information pertinent to point source and non-point source contribution of organics to drinking water supplies. The following sections of this report summarize the results of the study, recommend a program plan to fully characterize and possibly eliminate the problem of hazardous organics in drinking water on a nation-wide scale, and present the data found for the individual chemicals on the list and the methodology used to acquire the information.

2.0 SUMMARY

The discharge of treated or untreated industrial waterborne effluents is the most obvious industrial contribution to the presence of organics in drinking water. Since the legal requirements for discharge from point sources have in the past emphasized allowable BOD, many industries have chosen to chlorinate their final effluent in order to meet this standard. This practice can, however, create highly refractory substances even though the legal requirements on BOD are satisfied.

Discharged compounds may pass through municipal systems unchanged, may become halogenated, or may be partially or completely degraded. Certain of these compounds may also be precursors of other pollutant compounds found in downstream drinking water supplies.

Industry may also contribute a certain amount of organics to the air through stack emissions, incineration and evaporation of volatile solvents. These compounds may be reintroduced to surface waters and soil by rainfall.

Industrially related compounds may reach drinking water supplies through ground water contamination. Organic constituents of landfilled solid wastes, sludges, and slurries may leach through soil to ground water due to rainfall and surface runoff. These leached compounds may be partially or completely degraded by soil microorganisms. Chemical interactions may also occur during soil and ground water migration forming other organic compounds potentially destined for surface waters.

In addition to industrial wastes, discharges from domestic treatment plants may also be responsible for a variety of chlorinated organics found in drinking water. Similarly, chlorination of river water containing natural and/or synthetic organics has been found to produce several halomethanes and haloethanes.

There were 162 compounds on the original list of organic chemicals under consideration. Eight have been deleted as either incorrect designations or duplicates. The investigation of the remaining 154 compounds included identification of industrial, municipal, natural and consumer related sources of air and water contamination, assessment of biodegradability and effective treatment methods and gross estimates of annual discharge from industrial sources.

Of the 154 compounds, 113 have been classified as major products or by-products according to the 1973 SRI Directory of Chemical Producers (USA). (It was found that 34 SIC categories provided almost complete coverage of the major producers and users of these chemicals.) The remaining chemicals have been found to be manufacturing contaminants, metabolites or degradants of other compounds,

compounds from natural sources, or formations arising from water and sewage treatments. In a few cases, however, no information could be found regarding chemical origin.

Gross estimates of annual industrial discharge ranged from less than one ton per year for certain pesticides, to approximately 100,000 tons per year in the case of benzene, which arises from petroleum refining as well as from many other less significant industrial processes.

General consumer use of industrial products is a major though much less obvious source of contamination of air, soil and water. An example is the manufacture of paints and coatings where only 1-3 per cent of starting materials and product may be lost to air, water or solid waste. However, after application by the consumer, all the material is eventually released to the environment. Loss during industrial product use appears to be the greatest potential source of organic pollutants because recovery of product is maximized during industrial manufacture.

Sixty-seven of the compounds under consideration may be formed by various chemical reactions in air, water or soil. These include photoactivated radical reactions, oxidation and photooxidation reactions, aqueous halogenation reactions, degradative reactions by soil organisms, epoxidation reactions, etc. An example of a gaseous photochemical reaction is formaldehyde plus hydrogen chloride forming chloromethyl ether. This compound may subsequently reach surface waters during a rainfall.

From the information gathered on biodegradability and persistence, the organic compounds were divided into five categories: (1) easily degraded; (2) degraded without much difficulty; (3) difficult to degrade; (4) very difficult to degrade; and (5) refractory. Category 1 includes 7 of the 154 chemicals; category 2 includes 17; category 3 includes 41; category 4 includes 36; and category 5 includes 53. More than 80 per cent of the identified compounds appear in categories 3 through 5. This would be expected, since less persistent chemicals should degrade closer to their sources before they could be detected by sampling and be identified. Because most of these chemicals are not readily biodegradable, they must be concentrated by physical-chemical methods and then incinerated or properly disposed by other methods. Other treatment methods which are effective in varying degrees in removing most of these chemicals include activated carbon, biological treatment and volatilization by spray aeration.

Near the conclusion of the present study the scope of work was expanded by EPA to include an Appendix (D) which would list the cities where each specific organic chemical has been reported. The purpose was to indicate what is known about the nationwide occurrence of specific organic compounds in drinking water. National occurrence data is given for all 154 chemicals which had been identified in drinking water as of 11/25/74, and for an additional 68 compounds which had been reported in the last week of the project as a result of a continuing effort by EPA, or were reported in the primary literature and will be included in the future EPA listings of organic compounds identified in drinking water.

3.0 RECOMMENDATIONS

3.1 Proposed Program Plan

Objective: To characterize industrial sources of organic pollutants and to correlate industrial discharges with the presence of specific organics in selected drinking water supplies.

Scope: The program will be limited to the identification and quantification of industrial point sources of discharge. These discharges may be to water bodies, municipal waste treatment facilities or aquifers through percolation, leaching, runoff, etc.

Technical Approach: The objectives of this program will be reached by the accomplishment of the following tasks:

Task 1 - Identification and Correlation of Past and Present Effort Regarding Organics in Drinking Water

Ten major drinking water supplies selected by EPA will be covered in a comprehensive manner for complete identification of selected organic pollutants found in each water supply which are considered by EPA to be actual or potential health hazards while eighty other drinking water supplies selected by EPA will be limited to the identification of selected volatile organics.

This task will be a continuing one through the program with heavy emphasis during the first six months. It will involve an intensive literature search and/or contacting all past and present EPA contractors, EPA regional offices, NERC's, EPA field laboratories, other Federal and local agencies, and universities to compile the results of past and present efforts pertinent to this study. These results will be analyzed for thoroughness regarding the identification of all probable industrial contributors to the specific water supplies. Areas where data appear to be weak or missing will be pointed out and arrangements will be made to obtain the needed information either by additional effort on the part of the original investigators or by fill-in effort by the contractor.

At the end of six months, an interim report will be submitted documenting the results of Task 1 effort to date and recommending necessary technical efforts to achieve the program objectives.

The continuing effort of Task 1 will involve the updating of information as it becomes available from the various monitoring sources such as annual reports from the states on the quality of all navigable waters as required by Section 305 (b) (1) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) and other sources engaged in continuing programs of this nature. Other efforts in this task will include the standardization of sampling, analytical and reporting methods. Another important effort in this task should be the investigation of modeling techniques suitable for performing mass balances on waterways. A schematic diagram showing possible sources of waterway contamination is given in Figure 3.1. The scope of the proposed program is included within the dotted lines on this figure.

Task 2 - Characterization of Industrial Input to the Various Drinking Water Supplies

This task can be initiated on any of the EPA specified cities and associated drinking water supplies while Task 1 data is being gathered for those specific locations. The magnitude of this task for each of the drinking water supplies will depend on the size of the supply and on the amount of pertinent information previously gathered on the supply. The gathering of this information is necessarily a multidisciplinary project including such fields as geology, hydrology, analytical, organic, and physical chemistry, economics, and chemical and civil engineering. A suggested method of achieving the program objectives for any of the drinking water supplies is given below using Washington, D.C. and the Potomac River Basin as an example city and source of drinking water supply respectively.

Subtask 1. Compile all information available on the Potomac River Basin such as the specific hazardous or potentially hazardous organic chemicals identified in Washington, D.C. drinking water, the location of and data extracted from all existing monitoring stations in the basin (both state and federal), from EPA Region III office, and any data measured on effluents from specific industrial plants. For example, the State Base Water Quality Monitoring Network on the Potomac River Basin consists of 55 sampling stations strategically located at the confluence of major tributaries and near U.S. Geological Survey Basin gauging stations to take advantage of their flow measurements.

Subtask 2. Utilize the NPDES Permit Program to list every individual establishment having a point source discharge into the Potomac or any of its tributaries. Select those facilities which are suspect as probable sources of those organic chemicals selected by EPA to be health hazards, identified in Washington, D.C. drinking water. Utilizing Section 308 of the FWPCA, contact these facilities to obtain industrial concurrence of the possible discharge of the chemical(s) from their plant or other precursor chemicals which could possibly react in some way with other chemical(s) present in the receiving water body to form the identified organics. If possible, quantify the discharges and effectiveness of the wastewater treatment system used.

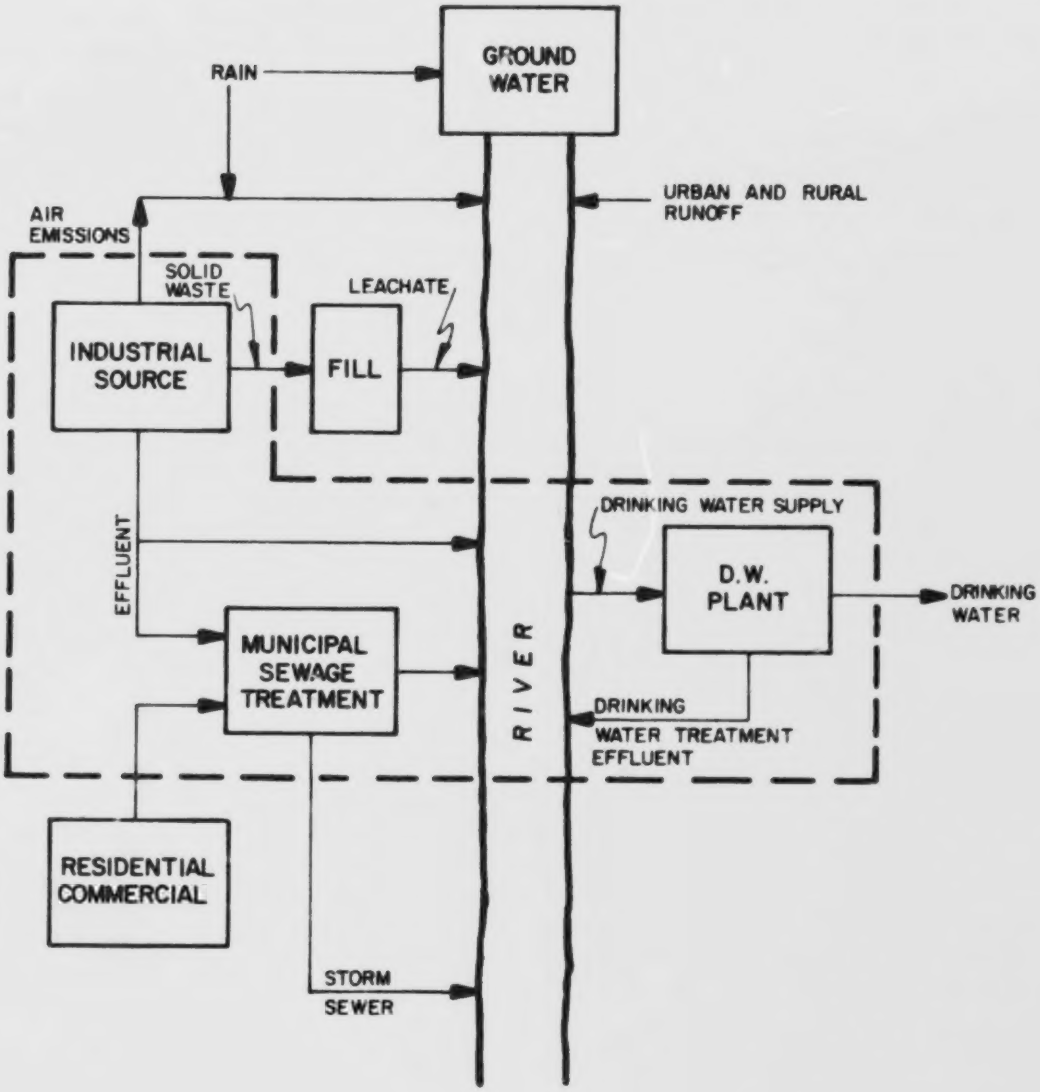

GROUND WATER
RAIN
URBAN AND RURAL RUNOFF
AIR EMISSIONS
SOLID WASTE
LEACHATE
INDUSTRIAL SOURCE
FILL
DRINKING WATER SUPPLY
D.W. PLANT
DRINKING WATER
EFFLUENT
MUNICIPAL SEWAGE TREATMENT
RIVER
DRINKING WATER TREATMENT EFFLUENT
RESIDENTIAL COMMERCIAL
STORM SEWER

FIGURE 3.1
SCHEMATIC DIAGRAM OF PROPOSED SCOPE OF WORK

Subtask 3. Contact all municipal wastewater treatment facilities identified from the NPDES Permit Program that discharge into the Potomac or any of its tributaries and obtain a listing of all industrial users of municipal sewage systems. Utilize a Dun and Bradstreet search by SIC code and by state and/or county as a cross check. Once this list is established, repeat subtask 2.

Subtask 4. Identify all drinking water supplies upstream of Washington, D.C. and contact them to obtain any pertinent information useful to the program such as analyses of river water for specific organic chemicals and water use rates.

Subtask 5. Determine whether or not the information available from subtasks 1 through 4 is sufficient to perform a mass balance on the river to confirm the industrial sources of the selected organics. Determine if the existing sampling sites are located properly with respect to the industrial discharges or if non-point sources such as agricultural runoff could be responsible for the presence of the chemical(s).

Subtask 6. If the results of subtask 4 are negative or marginal, select the appropriate industrial facilities for effluent sampling. For plants using municipal sewage systems, the samples should be taken of the plant effluents. Care should be taken to obtain representative samples and flow measurements over periods of time while the manufacturing processes, suspect as sources of the waste organic chemicals, are operating. The samples should be analyzed by standard EPA methods using GC-MS techniques for the organics in question.

Subtask 7. Taking into consideration the persistency of the selected identified organic chemicals and/or the possibilities of reaction with other chemicals present downstream to form any of the pertinent chemicals, prepare a list of industrial sources along with their respective contributions to the river. Then sample the river and analyze for any of the pertinent organic chemicals. Compare the industrial input of the selected organic chemicals with the totals of these chemicals previously and presently measured in the river at Washington, D.C. and assess the contribution by non-point sources. This approximates a materials balance on the river.

Task 3 - Recommendation of Abatement Practices and Associated Costs

This task can be initiated as soon as positive identification of industrial point sources are made. It involves contact with industrial plant personnel to discuss the possible elimination of the specific chemicals of principal concern in their discharge to the river or to a municipal sewage system by raw material changes, process changes, improvements in wastewater treatment techniques, etc., and to obtain estimates of capital and operating costs for the proposed abatement practices.

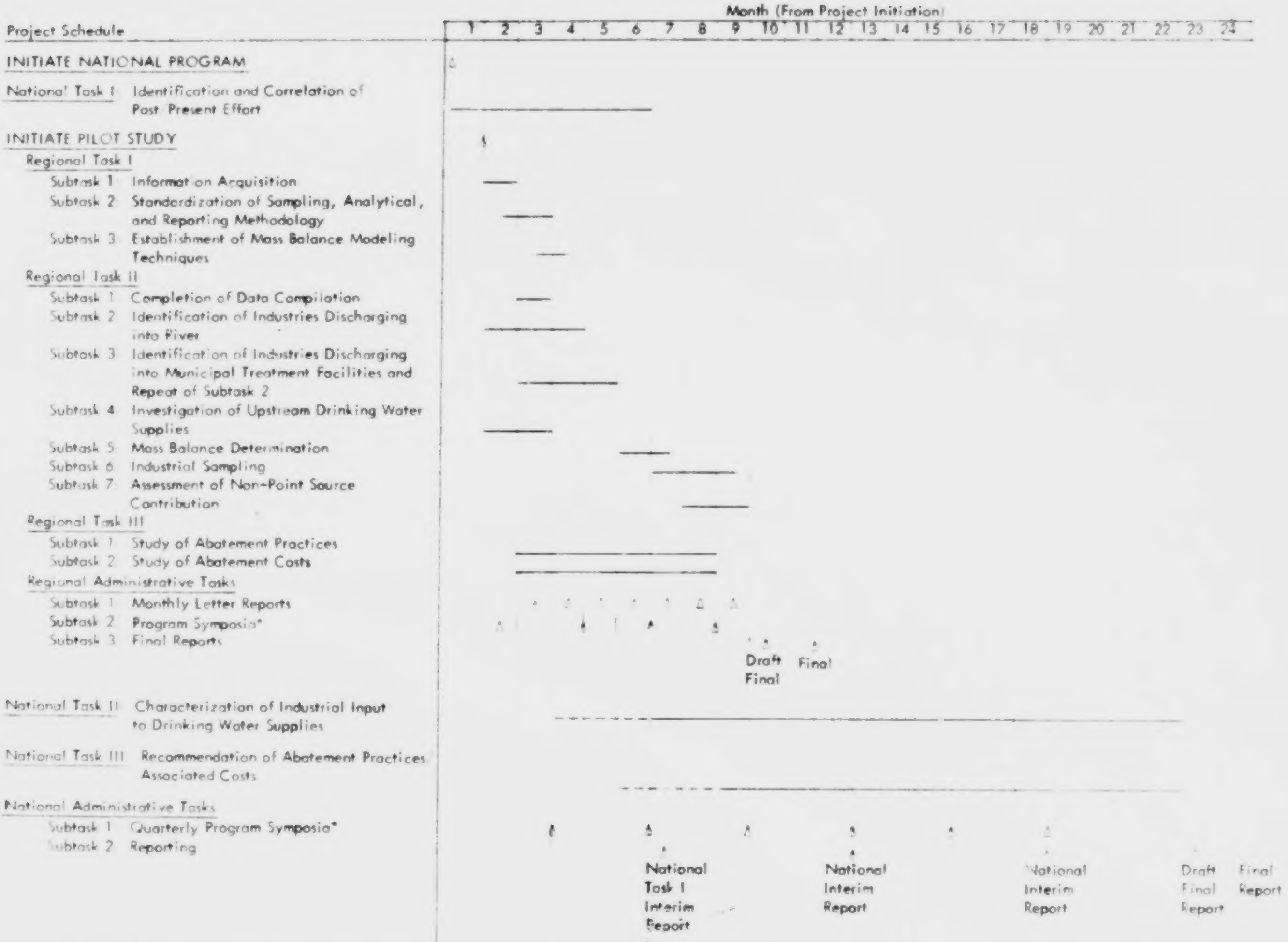
In order to recommend cost-effective treatment, it is necessary to correlate the figures from industry to costs for prospective drinking water treatment techniques.

3.2 Recommended Plan Implementation

Although the preceding program plan is constructed to be implemented on a nation-wide basis with simultaneous investigations of each selected city and associated water supply, it is recommended that a pilot study be performed to determine the effectiveness of the plan.

It is recommended that as soon as possible after the start of Task 1, EPA decide on one city and associated water supply, for which considerable data exists, to be investigated using the proposed plan. In the area selected, the regional EPA office and appropriate NERC center should be included in the planning and implementation of the study. This pilot study will serve to determine the effectiveness of the plan and also will undoubtedly bring to light other ideas and courses of action that will strengthen the plan for use throughout the rest of the nation. The duration of the recommended pilot study is 10 months as shown on Figure 3.2, the proposed program schedule.

Figure 3.2 Proposed Program Schedule



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*Meeting attended by Federal EPA, Regional EPA, NERC's, Program Management Contractor, and all other interdisciplinary contractors, in fields such as geology, hydrology, analytical, organic, and physical chemistry, economics, and chemical and civil engineering.

4.0 TECHNICAL APPROACH AND RESULTS

4.1 Technical Approach

The following subsections describe how the technical objectives of this program were accomplished.

4.1.1 Data Collection and Assimilation

This program began with an extensive information gathering phase. This consisted of utilizing the Versar library and the Library of Congress, in addition to the resources available at the following U.S. Government agencies: Department of Agriculture, Tariff Commission, Bureau of Census, and Environmental Protection Agency. As research progressed, EPA activities in Cincinnati, Ohio, and Athens, Georgia, were visited in order to gain first hand knowledge of research and monitoring activities which impacted directly on the work. Additional data was acquired from the EPA Project Officers during the weekly meetings. In order to fully utilize technical expertise, consultants were also employed.

The initial effort included the identification of pollution sources and the development of several classification schemes which facilitated handling and presentation of the data. Several approaches were used to categorize the compounds under consideration: a chemist's approach resulted in a chemical classification scheme (alkanes, ketones, etc.), a chemical engineering approach led to classification by method of chemical manufacture, and finally, an assessment of potential discharge from industrial sources resulted in classification by SIC code.

4.1.2 Estimations of Annual Industrial Waterborne Discharges for Specific Organics

Several mathematical relationships were developed to estimate the annual discharge for each of the compounds. The methods were derived and applied on the basis of available data. The resulting estimates are intended to be only general indications of the magnitude of industrial organic discharge (gross estimates). Several variables which were used in making these estimates are explained below.

GE	Gross estimate of annual discharge
RWL	Raw waste load per unit of production (lbs raw waste/lb product)
AP	Annual production
CO	Concentration of organics in waterborne waste
CC	Concentration of a given compound in organic fraction of waterborne waste
TF	Treatment factor; 100%-national average treatment efficiency for various widely used treatments

UC	Per cent of annual production consumed by each specific use
UL	Per cent lost during each specific use (process dependent)
PF	Proportionality factor
CW	Average concentration of an organic constituent
WD	Annual wastewater discharge
WR	Ratio of gallons of treated wastewater per pound of product

Method 1

This method is used when the annual production, major industrial use distribution, raw waste load per unit of production and organic content of waterborne waste are known. Method 1 is a two step procedure. Part A is the estimated discharge from the manufacture of a given compound. Part B is the estimated discharge from the industrial uses of the compound.

A. The annual discharge of a compound due to its manufacture may be estimated by multiplying the raw waste load per unit of production (RWL), annual production of the compound (AP), the total percentage of organics in the waterborne waste (CO), the percentage of the given compound in the organic fraction (CC), and the average treatment factor (TF).

$$GE\underline{1A} = RWL \bullet AP \bullet CO \bullet CC \bullet TF$$

B. Estimation of annual discharge due to industrial use is based on the total annual production for a compound (AP), the per cent of annual production consumed by each specific use ($UC\underline{1...n}$), the percent which may be discharged during each specific use ($UL\underline{1...n}$), and an average treatment factor (TF). Total raw organic compound discharge is estimated by a summation of the products of the amount used for each application (AP•UC) and the specific loss factors (UL). This total, multiplied by an average treatment factor (TF), estimates the annual discharge due to industrial use.

$$GE\underline{1B} = [\sum(AP \bullet UC\underline{1} \bullet UL\underline{1} + AP \bullet UC\underline{2} \bullet UL\underline{2} + \bullet\bullet\bullet + AP \bullet UC\underline{n} \bullet UL\underline{n}] \bullet TF$$

The totals from industrial manufacture and use (parts A and B) are added together to give the estimate of annual discharge.

$$GE\underline{1} + GE\underline{1A} + GE\,\underline{1B}$$

Method 2

This method was used when sufficient information was available to determine annual discharge of a compound due to industrial use by Method 1B above, but insufficient data was available for an estimate by Method 1A. It was assumed that the industrial user source could be expected to account for a certain fraction of the total annual industrial discharge. This fraction was expressed as a proportionality factor (PF). By multiplying the discharge due to industrial use (GE1B) and the reciprocal of the proportionality factor the total annual industrial discharge was estimated. This equation is derived below.

$$PF \cdot GE2 = GE1B$$
$$(1/PF)\ \overline{(PF \cdot GE2)} = (GE\underline{1B})\ (1/PF)$$
$$GE\underline{2} = GE\underline{1B} \cdot \overline{1}/PF$$

Method 3

Method 3 was used when the average concentration of a given compound (x) in the waste stream of a given industry (y) was known. The discharge of the particular industrial segment was determined, and it was then assumed that this industrial segment accounted for a certain fraction of the total annual discharge expressed as a proportionality factor (PF). Total annual industrial discharge was estimated by multiplying the average concentration of the given compound in the waterborne effluent (CWi), the total annual wastewater discharge of the given industrial segment (WDi), and the reciprocal of the proportionality factor (PF). This equation is derived below.

$$PF \cdot GE3 = CWi \cdot WDi$$
$$(1/PF)\ \overline{(PF \cdot GE3)} = (CWi \cdot WDi)\ (1/PF)$$
$$GE\underline{3} = CW\underline{i} \cdot WD\underline{i} \cdot 1/PF$$

Method 4

This method was used for isodecane, decane, methane, nonane, octane and pentane which are potential pollutants in petrorefinery and polyolefin manufacturing waste streams along with other alkanes with higher carbon numbers. No information was found that would allow any of the previous three estimation methods to be employed. The estimate of annual industrial discharge of any of the above unsubstituted alkanes with ten or less carbon atoms was made equivalent to one half of the average annual discharge of all the unsubstituted alkanes with more than ten carbon atoms (determined by Method 3).

$$GE\underline{4} = 1/2\ GE\underline{3}$$

Method 5

Method 5 applies to pesticides and related compounds, and accounts only for the pollution potential due to their production, and not their use, which is of much greater significance. The calculations are based on actual production figures or reliable estimates. Method 5.1 was used for the diolefin-based insecticides (aldrin, chlordane, dieldrin, endrin, and heptachlor) where the ratio of gallons of treated wastewater per pound of product (WR) was known and was multiplied by the annual production (AP) to give the annual treated wastewater discharge, which was then multiplied by the known concentration of the compound in treated wastewater (CW), to estimate the annual discharge. The annual discharge estimate for heptachlor was used to extrapolate those of heptachlor epoxide and heptachloronorbornene assuming that these compounds would be present in an amount proportional to that of heptachlor.

The estimates of annual discharge for atrazine, (de)ethyl atrazine, DDE, DDT, hexachlorobenzene, hexachlorocyclohexane or lindane, pentachlorophenol, and 2,4, 6-trichlorophenol (Method 5.2) were also based on production figures. Multiplying production (AP) by a factor of 3 1/2% (typical amount of waste from chlorination processes) determined the level of pesticides in raw waste, and then applying a 99% treatment factor yielded the final gross estimate of annual discharge.

$$\text{GE}\underline{5.1} = \text{WR} \bullet \text{AP} \bullet \text{CW}$$
$$\text{GE}\underline{5.2} = \text{AP} \bullet 3.5\% \bullet \text{TF}$$

Method 6

This method was designed for those compounds for which no information was found that would allow any of the previous five estimation methods to be employed.

The estimate of annual industrial discharge of a given compound was assumed to be equal to the product of the average concentration of the compound in municipal sources ($\text{CW}\underline{m}$), the annual municipal discharge ($\text{WD}\underline{m}$), and the reciprocal of a proportionality factor (PF) relating the importance of the entire industry's discharge to that of the municipal segment.

$$\text{GE}\underline{6} = \text{CW}\underline{m} \bullet \text{WD}\underline{m} \bullet 1/\text{PF}$$

Method 7

In this method, the estimated annual discharge of a given compound was obtained by correlating that compound to another compound with similar uses, properties or structure. For instance, the gross estimate of annual discharge of trichlorofluoromethane is one ton per year. Although dichlorodifluoroethane is used industrially in a similar fashion, it is much less volatile. For this reason, its annual discharge was estimated to be 10 tons per year or an order of magnitude higher than the more volatile chemical.

$$\text{GE}\underline{7} = \text{Comparison with GE}\underline{1-6}$$

4.1.3 Chemical Reactions

The identification of chemical reactions that could form any given compound was achieved primarily by an intensive literature search and extrapolation of information to general classes of compounds. The concept of "chemical reactions" was interpreted to mean any interaction of two or more chemicals, or any degradation of, or evolution from, a parent or precursor compound to form a given compound in air, water, or soil.

4.1.4 Biodegradability (Persistence)

Five broad categories of biodegradability were developed to encompass the range of environmental persistence and treatability which various compounds may exhibit in the environment. The persistency characteristics of the chemicals were investigated, and each compound was placed in the category which most completely represented its behavior. Table 4.1.1 lists the biodegradability, persistence and treatability parameters for each of the five categories.

Persistence was weighted toward ease of biodegradation in water and soils. It is recognized that many nonbiological reactions and physical processes may influence the persistence of certain compounds. For example, the multi-halogenated methanes and ethanes were classified as refractory because of resistence to biodegradation, although they volatilize quickly from water and soils to the air where free radical reactions and high energy oxidations will affect their overall environmental persistence.

Table 4.1.1 Biodegradability (Persistence) Categories

Category	Biodegradability	Persistence in Unadapted Soil	Success of Biological Treatment of Point Source	Typical Chemical
(1)	Easily degraded	1-3 weeks	Susceptible to normal waste treatment.	Acetic acid
(2)	Degraded without much difficulty	1-3 months	Susceptible to normal waste treatment.	Benzoic acid
(3)	Difficult to degrade	3 months to 1 year	Prolonged treatment needed.	e-caprolactam
(4)	Very difficult to degrade	1-2 years	Leakage possible even with prolonged treatment.	Chlorobenzene
(5)	Refractory	> 2 years	Cannot be treated biologically.	Hexachlorobenzene

4.1.5 Data Display

The most concise and meaningful method for displaying the gathered material was to provide separate data sheets for each chemical. An important advantage of this format is the amenability of the display to an automated file system, which provides an easily usable form for the Office of Toxic Substances, EPA. The individual information sheets are presented in Appendix C.

The chemical name, structure, chemical class and CAS number (if assigned), all serve to identify the specific chemical (Sections 1-3).

For each chemical, Sections 4A, B, and C focus on potential discharge sources to both water and air from industrial point sources, treatment point sources and non-point sources. Industrial sources consist of chemical manufacturers and those industries utilizing one of the chemicals in some production capacity (Section 4A). The gross estimates of annual discharge of each chemical from all industrial sources is given in Section 4.A.3 of each data sheet. These estimates do not include discharges from treatment point sources or non-point sources. Section 4B presents data on the potential formation of the compounds during waste treatment and disposal. Treatment of sewage and solids, incineration, other disposal technologies, and drinking water treatment systems were considered as possible pollutant sources. In section 4C non-point sources of discharge were considered. These non-point sources were broken down into four categories: natural sources occurring through normal growth and metabolic cycles; possibility of formation by chemical reaction of proper constituents in air and/or water; leaching from solid waste piles or landfills where a compound is present; man-caused sources such as agricultural application of pesticides resulting in agricultural runoff.

Sections 5 and 6 deal with biodegradability and effective treatment method. Biodegradability is a measure of the persistence of a chemical through a biological treatment system or natural biological degradation. Categories were assigned indicating degree of difficulty of degradation for each chemical. Treatment methods for each chemical were included and their effectiveness noted where this information was available.

4.2 Categorizations

The list of compounds identified in drinking water was categorized in three ways, by chemical class, by method of industrial manufacture, and by the manufacturing Standard Industrial Classification (SIC) industries from which these chemicals might be discharged.

The chemical classification as shown in Table 4.2.1 is self explanatory. The Water Quality Criteria Data Book, Volume I: Organic Pollution of Freshwater classification system was followed.

The categorization according to industrial method of manufacture appears in Table 4.2.2 and was made utilizing similarities of manufacture. Those chemicals with several methods of manufacture were listed under each appropriate category. The industrial categorization scheme is not exhaustive, and was intended primarily to assist in data analysis for the various groupings of compounds.

A great variety of industrial uses of the subject chemicals was evidenced as the project progressed. As a means of illustrating the diverse sources of specific chemical release to waters, the probable discharge sources were categorized according to manufacturing SIC industries in Table 4.2.3. Information concerning organic constituents was obtained from the Southeast Environmental Research Lab, from EPA Surveillance and Analysis data files, from a variety of literature sources concerning industrial effluents, and from the industrial uses of the subject compounds. Industries identified as having one or more compounds in their effluent were grouped into 4-digit SIC codes. Only point sources of industrial manufacture and use were considered; this excluded all potential discharges resulting from agricultural application, domestic use, etc. Because of the short duration of this program, this categorization should not be considered inclusive.

Table 4.2.1 Categorization by Chemical Class

ALKANES AND ALKENES

Unsubstituted

decane (46)
docosane (72)
n-dodecane (73)
eicosane (74)
2-ethyl-n-hexane (79)
hexadecane (91)
isodecane (94)
limonene (99)
methane (101)
nonane (121)
octadecane (122)
octane (123)
pentadecane (127)
pentane (128)
tetradecane (140)
n-tridecane (149)
n-undecane (152)

Halogenated

Cyclic

aldrin (7)
chlordane (32)
dieldrin (56)
endrin (75)
heptachlor (84)
heptachlor epoxide (85)
1,2,3,4,5,7,7-heptachloronorbornene (86)
hexachlorocyclohexane (89)

Noncyclic

acetylene dichloride (6)
bromodichloromethane (22)
bromoform (23)
butyl bromide (27)
carbon tetrachloride (31)
chloroform (36)
dibromochloromethane (48)
dibromodichloroethane (49)
dichlorodifluoroethane (53)
1,2-dichloroethane (54)
hexachloro-1,3-butadiene (88)
hexachloroethane (90)
methyl chloride (108)
octyl chloride (124)
tetrachloroethane (138)
tetrachloroethylene (139)
1,1,2-trichloroethane (145)
1,1,2-trichloroethylene (146)
trichlorofluoromethane (147)
methylene chloride (117)

Table 4.2.1 Categorization by Chemical Class - continued

ALCOHOLS

borneol (19)
di-isobutyl carbinol (61)
ethanol (76)
isoborneol (96)
1-terpineol (135)
methanol (102)
methyl phenyl carbinol (1-phenylethanol) (114)
pentanol (129)
propanol (132)

AMINES

Aliphatic

ethylamine (77)
propylamine (133)

Nitriles

2-hydroxyadiponitrile (92)

Heterocyclic

atrazine (8)
(deethyl) atrazine (9)
barbital (10)
3-chloropyridine (42)
2-methyl-5-ethyl-pyridine (110)
trimethyl-trioxo-hexahydro-triazine isomer (150)

Amine derivatives - Amides

e-caprolactam (29)

BENZOTHIAZOLES

benzothiazole (16)
methyl benzothiazole (105)
thiomethylbenzothiazole (141)

Table 4.2.1 Categorization by Chemical Class - continued

ORGANIC ACIDS

Carboxylic

acetic acid (3)
benzoic acid (14)

Sulfonic

benzene sulfonic acid (13)

ESTERS

Phthalates

benzyl butyl phthalate (18)
dibutyl phthalate (51)
diethyl phthalate (57)
di (2-ethyl hexyl) phthalate (58)
dihexyl phthalate (59)
di-isobutyl phthalate (62)
dimethyl phthalate (66)
dipropyl phthalate (71)

Alkyl Esters

behenic acid, methyl ester (11)
dioctyl adipate (70)
methyl ester of lignoceric acid (100)
methyl palmitate (113)
methyl stearate (116)

Aryl Esters

methyl benzoate (104)
phenyl benzoate (130)
phthalic anhydride (131)

PHOSPHATE ESTERS

triphenyl phosphate (151)

Table 4.2.1 Categorization by Chemical Class - continued

ALDEHYDES AND KETONES

Halogenated

bromoform butanal (24)
chlorohydroxy benzophenone (37)
1,1,3,3-tetrachloroacetone (136)

Alkane Derivatives

acetaldehyde (2)
acetone (4)
3-methyl butanal (107)
methyl ethyl ketone (109)
2-methylpropanal (115)

Cyclic Alkane Derivatives

camphor (28)
dihydrocarvone (60)
isophorone (95)

Aryl Alkane Derivatives

acetophenone (5)

ETHERS

Non-Halogenated

1,2-dimethoxy benzene (63)
cis-2-ethyl-4-methyl-1, 3-dioxolane (80)
trans-2-ethyl-4-methyl-1, 3-dioxolane (81)
2-methoxy biphenyl (103)

Halogenated

bromophenyl phenyl ether (25)
1,2-bis-chloroethoxy ethane (34)
b-chloroethyl methyl ether (35)
dichloroethyl ether (55)
bis-chloroisopropyl ether (38)
chloromethyl ether (39)
chloromethyl ethyl ether (40)

Table 4.2.1 Categorization by Chemical Class - continued

AROMATICS

Unsubstituted

acenapthylene (1)
benzene (12)
benzopyrene (15)
indene (93)
napthalene (118)

Phenols and Quinones

o-cresol (43)
di-t-butyl-p-benzoquinone (50)
2,4-dimethyl phenol (65)
4,6-dinitro-2-aminophenol (68)
guaiacol (83)
pentachlorophenol (126)
2,4,6-trichlorophenol (148)

Aromatic Derivatives

Halogenated

Benzene Derivatives

bromobenzene (20)
bromochlorobenzene (21)
chlorobenzene (33)
m-chloronitrobenzene (41)
dibromobenzene (47)
1,4-dichlorobenzene (52)
hexachlorobenzene (87)
trichlorobenzene (143)

Aryl Alkane Derivatives

DDE (44)
DDT (45)

Biphenyl Derivatives

pentachlorobiphenyl (125)
tetrachlorobiphenyl (137)
trichlorobiphenyl (144)

Nitro Compounds

2,6-dinitrotoluene (69)
nitroanisole (119)
nitrobenzene (120)

Table 4.2.1 Categorization by Chemical Class - continued

Aryl Alkanes

butyl benzene (26)
1,3-dimethylnapthalene (64)
ethyl benzene (78)
o-ethyltoluene (82)
1-isopropenyl-4-isopropylbenzene (97)
isopropyl benzene (98)
methyl biphenyl (106)
methylindene (111)
methyl napthalene (112)
propylbenzene (134)
toluene (142)
vinyl benzene (153)
xylene (154)

MERCAPTANS AND OTHER SULFUR ORGANICS

benzothiophene (17)
carbon disulfide (30)
dimethyl sulfoxide (67)

Table 4.2.2 Categorization by Manufacturing Method

PETROLEUM DISTILLATES

acenaphthylene (1)
benzene (12)
benzopyrene (15)
o-cresol (43)
decane (46)
1,3-dimethylnaphthalene (64)
2,4-dimethyl phenol (65)
docosane (72)
n-dodecane (73)
eicosane (74)
ethyl benzene (78)
2-ethyl-n-hexane (79)
hexadecane (91)
indene (93)
isodecane (94)
isopropyl benzene (98)
methane (101)
methyl naphthalene (112)
naphthalene (118)
nonane (121)
octadecane (122)
octane (123)
pentane (128)
tetradecane (140)
toluene (142)
n-tridecane (149)
n-undecane (152)
xylene (154)
pentadecane (127)

CONSTITUENTS IN PETROLEUM REFINING AND COAL PROCESSING WASTES

acetaldehyde (2)
benzopyrene (15)
butyl benzene (26)
carbon disulfide (30)
carbon tetrachloride (31)
1,3-dimethylnaphthalene (64)
ethanol (76)
ethylamine (77)
1-isopropenyl-4-isopropylbenzene (97)
methanol (102)
propylbenzene (134)

PHTHALIC ANHYDRIDE REACTIONS

benzyl butyl phthalate (18)
dibutyl phthalate (51)
diethyl phthalate (57)
di(2-ethyl hexyl) phthalate (58)
dihexyl phthalate (59)
di-isobutyl phthalate (62)
dimethyl phthalate (66)
diprophyl phthalate (71)

ESTHER OF ACIDS

behenic acid, methyl ester (11)
dioctyl adipate (70)
lignoceric acid, methyl ester (100)
methyl benzoate (104)
methyl palmitate (113)
methyl stearate (116)

Table 4.2.2 Categorization by Manufacturing Method - continued

VARIOUSLY RECOVERED FROM NATURAL MATERIALS

borneol (19)
camphor (28)
guaiacol (83)
isoborneol (96)
limonene (99)
methyl benzoate (104)
1-terpineol (135)

OXIDATION OF ALCOHOLS

acetaldehyde (2)
acetic acid (also oxidation of acetaldehyde) (3)
acetone (4)
3-methyl butanal (107)

OXIDATION OF OTHERS

acetaldehyde (sat. HC's or ethylene)(2)
acetic acid (3)
acetophenone (ethyl benzene) (5)
benzoic acid (from toluene) (14)
dieldrin (from aldrin) (56)
endrin (from isodrin) (75)
heptachlor epoxide (heptachlor with $Na_2Cr_2O_7$)(84)
methanol (partial oxidation of natural gas HC's) (102)
methyl ethyl ketone (119)
phthalic anhydride (131)
propanol (132)
dimethyl sulfoxide (from dimethyl sulfide) (67)

DEHYDROGENATIONS OR DEHYDROHALOGENATIONS (UNSATURATED)

acetylene dichloride (red. of tetrachloroethane or trichloroethane) (6)
trichloroethylene (tetrachloroethane) (146)
vinyl benzene (153)

ALKYLATION OF AROMATICS

ethyl benzene (78)
o-ethyltoluene (82)
isopropyl benzene (catalysis)(98)
nitroanisole (119)
propylbenzene (catalysis by-product) (134)

Table 4.2.2 Categorization by Manufacturing Method - continued

HALOGENATION OF AROMATICS

bromobenzene (20)
bromochlorobenzene (21)
chlorobenzene (33)
chloronitrobenzene (with I_2 catalyst)(41)
dibromobenzene (47)
dichlorobenzene (52)
hexachlorobenzene (87)
hexachlorocyclohexane (89)
pentachlorobiphenyl (125)
pentachlorophenol (126)
tetrachlorobiphenyl (137)
trichlorobenzene (143)
trichlorobiphenyl (144)
trichlorophenol (148)

HALOGENATION OF NON-AROMATICS

acetylene dichloride (6)
bromodichloromethane (22)
bromoform (23)
butylbromide (27)
carbon tetrachloride (31)
chloroform (36)
dibromochloromethane (48)
ethylene dichloride (54)
hexachloroethane (90)
methyl chloride (108)
methylene chloride (117)
octyl chloride (124)
tetrachloroethane (138)
tetrachloroethylene (139)
trichloroethane (145)
trichlorofluoromethane (146)
bis-chloroisoprophyl ether (38)
chloromethyl ether (39)
chloromethyl ethyl ether (40)
dichloroethyl ether (55)
chlordane (32)
heptachlor (84)

HYDROGENATIONS

ethanol (catalysis) (76)
propylamine (133)
borneol (19)
isoborneol (96)
di-isobutyl carbinol (61)
4,6-dinitro-2-aminophenol (68)

CONDENSATIONS

Butyl benzene: benzyl chloride + propylbromide + sodium →
benzene + n-butyl chloride, $AlCl_3$ (catalyst) (26)

DDT: chloral (or chloral hydrate) + chlorobenzene, H_2SO_4 (catalyst) (45)

Dichloroethyl ether: ethylene chlorohydrin, H_2SO_4 (catalyst) (55)

ethylene chlorohydrin + chlorine + ethylene, aqueous, secondary method

Table 4.2.2 Categorization by Manufacturing Method - continued

CONDENSATIONS - continued

Ethylamine: ethyl chloride + alcoholic ammonia (77)

Methyl benzoate: HCl through benzoic acid, methanol mixture (104)

Methyl benzothiazole: o-aminophenols + ethyl chloride (105)

Terpineol: terpin hydrate + H_3PO_4 (or dilute H_2SO_4) (135)

MISCELLANEOUS

Carbon disulfide: petroleum, natural gas, coal fractions with sulfur (30)

Benzene sulfonic acid: sulfonation (13)

Nitroanisole: chlorination and hydrolysis (119)

Pentanol: chlorination and hydrolysis (129)

Dinitrotoluene: nitrating aromatics (nitrotoluene) (69)

Nitrobenzene: nitrating aromatics (120)

Acetic acid: fermentation (methanol + CO, or destructive distillation of hardwood) (3)

Acetaldehyde: hydration of acetylene (2)

Aldrin: diels-alder addition (bicycloheptadiene) (7)

Barbital: replacement of urea by dicyanodiamide (10)

Benzoic acid: decarboxylation of phthalic anhydride with steam
hydrolysis of benzotrichloride (14)

Benzothiazole: ring closure (o-aminothiophenols + acid chloride) (16)

Table 4.2.2 Categorization by Manufacturing Method - continued

MISCELLANEOUS - continued

e-caprolactam: possibly, cyclohexanone → nitrocyclohexane →

cyclohexanone oxime → e-caprolactam (29)

Guaiacol: catalytic synthesis. diazotization of o-anisidine, treat with dilute H_2SO_4 (83)

Methanol: catalytic synthesis ($CO + H_2$) (102)

Methyl ethyl ketone: mixed processes (109)

2-methyl-5-ethyl pyridine: possibly, paraldehydes + NH_3 (110)

(petroleum) butene + H_2 + CO. Oxo process

Methyl phenyl carbinol: Grignard, formaldehyde + benzyl grignard (114)

2-methyl propanol: Oxo process. propene + H_2 + CO (from petroleum) (115)

Triphenyl phosphate: phenol + phosphorous oxychloride. Esterification. (151)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source

EXTRACTION OF PINE GUM
SIC 0843

1-terpineol (135)
borneol (19)
camphor (28)
isoborneol (96)
limonene (99)
methanol (102)
o-cresol (43)
guaiacol (83)

BOTTLED AND CANNED SOFT DRINKS AND CARBONATED WATERS
SIC 2086

n-docosane (72)
eicosane (74)
n-tridecane (149)
tetradecane (140)
pentadecane (127)
octadecane (122)
hexadecane (91)

BROAD WOVEN FABRIC MILLS, MAN-MADE FIBER AND SILK
SIC 2221

e-caprolactam (29)
2,4,6-trichlorophenol (148)
trichloroethylene (146)
trichlorobenzene (143)
tetrachloroethylene (139)
propylbenzene (134)
propylamine (133)
propanol (132)
methyl benzoate (104)
dibutyl phthalate (51)
tetradecane (140)
2-hydroxyadiponitrile (92)
methylpropanal (115)
borneol (19)
dichloroethyl ether (55)
bis-chloroisopropyl ether (38)
diethyl phthalate (57)
methyl naphthalene (112)
cis-2-methyl-4-ethyl dioxolane (80)
trans-2-methy-4-ethyl dioxolane (81)
dieldrin (56)
trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
pentachlorobiphenyl (125)
tridecane (149)
ethylene dichloride (59)
vinyl benzene (153)
chloroform (36)
acetophenone (5)
chlorobenzene (33)
dichlorobenzene (57)
toluene (142)
ethyl benzene (78)
naphthalene (118)
dodecane (73)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

WOOD PRESERVING
SIC 2491

trichlorophenol (148)
o-cresol (43)
methyl naphthalene (112)
dimethyl phenol (65)
naphthalene (118)
acenaphthylene (1)
pentachlorophenol (126)
1-terpineol (135)

PAPER MILLS, EXCEPT BUILDING PAPER MILLS, PULP MILLS
SIC 2611 & SIC 2621

n-tridecane (149)
tetradecane (140)
pentadecane (127)
octadecane (122)
2-methylpropanal (115)
carbon disulfide (30)
n-docosane (72)
eicosane (74)
behenic acid, methyl ester (11)
borneol (19)
camphor (28)
dimethyl sulfoxide (67)
methyl palmitate (113)
methyl stearate (116)
hexachloroethane (90)
dodecane (73)
guaiacol (83)
hexadecane (91)
limonene (135)
1-terpineol (99)
n-undecane (152)
acetone (4)
methylene chloride (117)
propanol (132)
diethyl phthalate (57)
methyl benzoate (104)
chloroform (36)
acetic acid (3)
dodecane (73)
dihexyl phthalate (59)
di(2 -ethyl hexyl) phthalate (64)
methyl ester of lignoceric acid (100)
methyl ethyl ketone (109)
methanol (102)

PLASTICS MATERIALS, SYNTHETIC RESINS AND NON-VULCANIZABLE ELASTOMERS — SIC 2821

xylene (154)
vinylbenzene (153)
triphenyl phosphate
1,1,2-trichloroethylene (146)
propylbenzene (134)
propanol (132)
propylamine (133)
phthalic anhydride (131)
phenyl benzoate (130)
pentanol (129)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

PLASTICS MATERIALS, SYNTHETIC RESINS AND NON-VULCANIZABLE ELASTOMERS — SIC 2821 - continued

2-methyl propanal (115)
methyl benzoate (104)
methanol (102)
limonene (135)
isopropyl benzene (98)
decane (46)
n-undecane (152)
dichloroethyl ether (55)
hexadecane (91)
methyl naphthalene (112)
octadecane (122)
di-t-butyl-p-benzoquinone (50)
cis-2-ethyl-4-methyl-1,3-dioxolane(80)
trans-2-ethyl-4-methyl-1,3-dioxolane (81)
methyl chloride (108)
acenaphthylene (1)
acetaldehyde (2)
acetic acid (3)
dibromobenzene (47)
camphor (28)
e-caprolactam (29)
o-cresol (43)
dibutyl phthalate (51)
ethyl benzene (78)
methylene chloride (117)
diethyl phthalate (57)
di(2-ethyl hexyl) phthalate (58)
dihexyl phthalate (59)
di-isobutyl phthalate (62)
2,4-dimethyl phenol (65)

acetone (4)
acetophenone (5)
benzene (12)
benzene sulfonic acid (13)
benzoic acid (14)
benzyl butyl phthalate (18)
carbon disulfide (30)
hexachloro-1, 3-butadiene (88)
propylbenzene (134)
bromodichloromethane (22)
bromobenzene (20)
2-hydroxyadiponitrile (92)
naphthalene (118)
pentachlorophenol (126)
1-terpineol (135)
trichlorobenzene (143)
trichlorophenol (148)
thiomethyl benzothiazole (141)
dimethyl phthalate (66)
2,6-dinitrotoluene (69)
dioctyl adipate (70)
dipropyl phthalate (71)
ethanol (76)
ethylamine (77)
methyl ethyl ketone (109)
hexachloroethane (90)
trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
pentachlorobiphenyl (125)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

SYNTHETIC RUBBER (VULCANIZABLE ELASTOMERS)
SIC 2822

vinyl benzene (153)
n-tridecane (149)
1,1,2-trichloroethane (145)
tetradecane (140)
tetrachloroethylene (139)
tetrachloroethane (138)
propylamine (133)
pentadecane (127)
octadecane (122)
nitrobenzene (120)
2-methylpropanal (115)
methyl chloride (108)
isopropyl benzene (98)
hexadecane (91)
pentachlorophenol (126)
pentanol (129)
acetaldehyde (2)
acetic acid (3)
acetophenone (4)
acetylene dichloride (6)
benzene (12)
benzothiazole (16)
carbon disulfide (30)
carbon tetrachloride (31)
hexachloro-1,3-butadiene (88)
n-docosane (72)
eicosane (74)
ethanol (76)
hexachloroethane (90)
isophorone (95)
methyl naphthalene (112)
o-cresol (43)

PHARMACEUTICAL PREPARATIONS
SIC 2834

propylamine (133)
phthalic anhydride
2-methylpropanal (115)
3-methyl butanal (107)
methanol (102)
acetic acid (3)
acetone (4)
acetophenone (5)
benzene (12)
benzoic acid (14)
bromoform (23)
camphor (28)
chloroform (36)
3-chloropyridine (42)
o-cresol (43)
2,4-dimethyl sulfoxide (67)
ethanol (76)
o-ethyltoluene (82)
guaiacol (83)
hexachlorocyclohexane (89)
hexachloroethane (90)
nitrobenzene (120)
dimethyl sulfoxide (67)
methylene chloride (117)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

SOAP AND OTHER DETERGENTS, EXCEPT SPECIALTY CLEANERS
SIC 2841

1-terpineol (135)
borneol (19)
methylene chloride (117)
naphthalene (118)
benzene (12)

SPECIALTY CLEANING, POLISHING, AND SANITATION PREPARATIONS
SIC 2842

trichlorofluoromethane (147)
trichloroethylene (146)
trichloroethane (145)
trichlorobenzene (143)
tetrachloroethylene (139)
2-methylpropanal (115)
bis-chloroisopropyl ether (38)
trichlorofluoromethane (147)
dichlorodifluoroethane (53)
naphthalene (118)
methyl naphthalene (112)
benzene (12)
bromodichloromethane (22)
carbon tetrachloride (31)
acetone (4)
bromobenzene (20)
tetrachloroethane (138)
acetylene dichloride (6)
chloroform (36)
dibromobenzene (47)
ethylamine (77)
docosane (72)
eicosane (74)
n-tridecane (149)
tetradecane (140)
pentadecane (127)
propanol (129)
octadecane (122)
hexadecane (91)
trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
dichloromethane (117)

FLAVORING EXTRACTS AND FLAVORING SYRUPS, N.E.C.
SIC 2087
PERFUMES, COSMETICS AND OTHER TOILET PREPARATIONS
SIC 2844

1-terpineol (135)
phenylbenzoate (130)
2-methylpropanal (115)
3-methyl butanal (107)
methyl benzoate (104)
benzoic acid (4)
chloroform (36)
o-cresol (43)
dibutyl phthalate (51)
1,2-dichloroethane (54)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

FLAVORING EXTRACTS AND FLAVORING SYRUPS, N.E.C.
SIC 2087 - continued
PERFUMES, COSMETICS AND OTHER TOILET PREPARATIONS
SIC 2844 - continued

limonene (99)
isoborneol (96)
acetaldehyde (2)
acetophenone (5)
benzene (12)
borneol (19)
propanol (132)
methyl stearate (116)
1,2-dimethoxy benzene (63)
4,6-dinitro-2-aminophenol (68)
dioctyl adipate (70)
ethanol (76)
o-ethyltoluene (82)
guaiacol (43)
acenaphthylene (1)
camphor (28)
1,1,2-trichloroethylene (146)

PAINTS, VARNISHES, LACQUERS, ENAMELS AND ALLIED PRODUCTS
SIC 2852

trichlorobiphenyl (144)
tetrachloroethylene (139)
tetrachlorobiphenyl (137)
propylamine (133)
propanol (132)
pentachlorobiphenyl (125)
methyl stearate (116)
indene (93)
acetone (4)
benzothiazole (16)
acetylene dichloride (6)
benzene (12)
borneol (19)
methyl ethyl ketone (butanone) (109)
camphor (28)
bis-chloroisopropyl ether (38)
dimethyl sulfoxide (67)
2-ethyl-n-hexane (79)
trichlorofluoromethane (147)
pentachlorophenol (126)

GUM AND WOOD CHEMICALS
SIC 2861

acetone (4)
methanol (102)
1-terpineol (135)
methyl ester of lignoceric acid (100)
dimethyl sulfoxide (67)

Table 4.2.3 Categorization by Probable Manufacturing
SIC Industry Point Source - continued

CYLIC (COAL TAR) CRUDES, AND CYCLIC INTERMEDIATES, DYES AND ORGANIC PIGMENTS (LAKES AND TONERS) - SIC 2865

trichlorobiphenyl (144)
trichlorobenzene (143)
tetrachlorobiphenyl (137)
propylbenzene (134)
propylamine (133)
propanol (132)
phthalic anhydride (131)
pentachlorobiphenyl (125)
nitrobenzene (120)
acetophenone (5)
methylene chloride (117)
acetone (4)
benzothiazole (16)
benzopyrene (15)
benzothiophene (17)
carbon disulfide (30)
chlorobenzene (33)
m-chloronitrobenzene (41)
o-cresol (43)
diethyl phthalate (57)
ethylamine (77)
o-ethyltoluene (82)

nitroanisole (119)
naphthalene (118)
ethyl benzene (78)
acetaldehyde (2)
acetic acid (3)
acetylene dichloride (6)
benzene sulfonic acid (13)
benzoic acid (14)
acenaphthylene (1)
benzene (12)
dichlorobenzene (52)
methanol (102)
1,3-dimethylnaphthalene (64)
2,4-dimethyl phenol (65)
hexachlorobenzene (87)
indene (93)
methyl naphthalene (112)
pentachlorophenol (126)
toluene (142)
vinyl benzene (153)
xylene (154)

INDUSTRIAL ORGANIC CHEMICALS, N.E.C.
SIC 2869

Refrigerants and Aerosols

carbon tetrachloride (31)
dibromochloromethane (48)
dichlorodifluoroethane (53)
ethanol (76)
methyl chloride (108)

chloroform (36)
dibromodichloroethane (49)
dichloromethane (117)
trichlorofluoromethane (147)
acetylene dichloride (6)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

INDUSTRIAL ORGANIC CHEMICALS, N.E.C.
SIC 2869 - continued

Organic Fuel Propellants

dibutyl phthalate (51)
dimethyl phthalate (66)
diethyl phthalate (57)

Embalming Fluids

camphor (28)

Irritant Gases

chloromethyl ether (39)

Hydraulic and Transformer Fluids

hexachloro-1, 3-butadiene (88)
dimethylsulfoxide (67)
bromodichloromethane (22)
trichlorobiphenyl (144)
dibromobenzene (47)
bromoform (23)
tetrachlorobiphenyl (137)
pentachlorobiphenyl (125)

Organic Solvents

carbon disulfide (30)
ethylamine (77)
propanol (132)
propylbenzene (134)
napththalene (118)
2-methylpropanal (115)
methyl naphthalene (112)
methanol (102)
limonene (99)
isophorone (95)
acetophenone (5)
bromobenzene (20)
chlorobenzene (33)
bis-chloroisopropyl ether (38)
dichloroethyl ether (55)

Miscellaneous

dinitrotoluene (69)
cis-2-methyl-4-ethyl dioxolane (80)
trans-2-methyl-4-ethyl dioxolane (81)
vinyl benzene (153)
1,1,2-trichlorothylene (146)
1,1,2-trichloroethane (145)
trichlorobenzene (143)
toluene (142)
tetrachloroethylene (139)
tetrachloroethane (138)
phthalic anhydride (131)
pentanol (129)
pentane (128)
nitroanisole (119)
nitrobenzene (120)
methane (101)
acetaldehyde (2)
isopropyl benzene (98)
isoborneol (96)
hexachlorobenzene (87)
ethyl benzene (78)
n-dodecane (73)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

INDUSTRIAL ORGANIC CHEMICALS, N.E.C.
SIC 2869 - continued

Miscellaneous - continued

di-isobutyl carbinol (61)
1,2-dichloroethane (54)
dichloroethyl ether (55)
butyl bromide (27)
methyl ethyl ketone (109)
borneol (19)
behenic acid, methyl ester (11)
benzene (12)
benzene sulfonic acid (13)
benzoic acid (14)
bromochlorobenzene (21)
acetone (4)
acetic acid (3)

CROP PLANTING, CULTIVATING AND PROTECTION
SIC 0721
PESTICIDES AND AGRICULTURAL CHEMICALS, N.E.C.
SIC 2879

triphenyl phosphate (151)
2,4,6-trichlorophenol (148)
trichlorobenzene (143)
tetrachloroethane (138)
phthalic anhydride (131)
phenyl benzoate (130)
pentachlorophenol (126)
hexachloro-1,3-butadiene (88)
dimethyl naphthalene (64)
xylene (154)
tetrachlorobiphenyl (137)
camphor (28)
carbon disulfide (30)
carbon tetrachloride (31)
chlordane (32)
chlorobenzene (33)
dichloroethyl ether (55)
chloroform (36)
o-cresol (43)
DDE (44)
DDT (45)
dibromochloromethane (48)
1,4-dichlorobenzene (52)
aldrin (7)
1,2-dichloro ethane (54)
naphthalene (118)
methyl naphthalene (112)
methyl chloride (108)
methyl benzoate (104)
acenaphthylene (1)
benzene (12)
bromoform (23)
2-hydroxyadiponitrile (92)
dibutyl phthalate (51)
trichlorobiphenyl (144)
pentachlorobiphenyl (125)
dieldrin (56)
2,4-dimethyl phenol (65)
4,6-dinitro-2-aminophenol (68)
endrin (75)
o-ethyltoluene (82)
heptachlor (84)
heptachlor epoxide (85)
1,2,3,4,5,7,7-heptachloronorbornene (86)
hexachlorobenzene (87)
hexachlorocyclohexane (89)
hexachloroethane (90)
propylamine (133)
atrazine (8)
(deethyl) atrazine (9)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

ADHESIVES AND SEALANTS
SIC 2891

trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
propanol (132)
pentachlorobiphenyl (125)

EXPLOSIVES
SIC 2892

toluene (142)
nitrobenzene
benzene (12)
dihexyl phthalate
di-butyl phthalate
camphor (28)
2,6-dinitrotoluene
hexachloroethane
di(2-ethyl hexyl) phthalate

CHEMICALS AND CHEMICAL PREPARATIONS, N.E.C.
SIC 2899

trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
pentachlorobiphenyl (125)
bromodichloromethane (22)
bromoform (23)
carbon tetrachloride (31)
chloroform (36)
dibromochloromethane (48)
dibromodichloroethane (49)
hexachloroethane (90)
methanol (102)

PETROLEUM REFINING
SIC 2911

acenaphthylene (1)
benzene (12)
benzene sulfonic acid (13)
benzopyrene (15)
butylbenzene (26)
carbon disulfide (30)
o-cresol (43)
decane (46)
1,3-dimethyl naphthalene (64)
acetophenone (5)
o-ethyl toluene (82)
methylindene (111)
vinyl benzene (153)
napththalene (118)
nonane (121)
octadecane (122)
octane (123)
pentadecane (127)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

PETROLEUM REFINING
SIC 2911 - continued

docosane (72)
n-dodecane (73)
eicosane (74)
ethyl benzene (78)
2-ethyl-n-hexane (79)
hexadecane (91)
indene (93)
isodecane (94)
1-isopropenyl-4-isopropylbenzene (97)
isopropyl benzene (cumene) (98)
methane (101)
methyl napththalene (112)
dimethyl phenol (65)
1-terpineol (135)

pentane (128)
propylbenzene (134)
tetradecane (140)
toluene (142)
n-tridecane
undecane (152)
xylene (154)
bromobenzene (20)
triphenyl phosphate (151)
methyl phenyl carbinol (114)
methyl biphenyl (106)
di(2-ethyl hexyl) phthalate (58)
dioctyl phthalate
pentanol (129)

LUBRICATING OILS AND GREASES
SIC 2992

limonene (99)
2-methyl propanal (115)
trichlorobiphenyl (144)
tetrachlorobiphenyl (137)

pentachlorobiphenyl (125)
methyl stearate (116)
naphthalene (118)
methyl ethyl ketone (109)

LEATHER TANNING AND FINISHING
SIC 3111

propylamine (133)
methylene chloride (117)

2-methylpropanal (115)

GYPSUM PRODUCTS
SIC 3275

acetone (4)
methylene chloride (117)

propanol (132)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

ELECTRONIC COMPONENTS, N.E.C.
SIC 3679

vinyl benzene (153)
trichlorobiphenyl (144)
trichlorobenzene
tetrachlorobiphenyl (127)
DDT (45)
pentachlorobiphenyl (125)
carbon disulfide (30)
chloroform (36)
DDE (44)

PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
SIC 3861

acetic acid (3)
benzene (12)
dimethyl phthalate (66)
methylene chloride (117)

MANUFACTURING INDUSTRIES, N.E.C.
(Candle Mfg. and Match Mfg.)
SIC 3999

n-tridecane (149)
tetradecane (140)
pentadecane (127)
hexadecane (91)
docosane (72)
eicosane (74)
octadecane (122)
n-dodecane (73)

INDUSTRIAL GASES
SIC 2813

Acetylene Mfg.

benzopyrene (15)
naphthalene (118)
acenaphthylene (1)

ALKALIES AND CHLORINE
SIC 2812

hexachlorobenzene (87)
hexachloro-1,3-butadiene (88)

Table 4.2.3 Categorization by Probable Manufacturing SIC Industry Point Source - continued

INDUSTRIAL INORGANIC CHEMICALS
SIC 2819

benzopyrene (15)

PAPERBOARD CONTAINERS AND BOXES
SIC 265

acetaldehyde (2)
acetone (4)
methyl ethyl ketone (109)
methylene chloride (117)
o-cresol (43)
propanol (132)
diethyl phthalate (57)

BUILDING PAPER AND BUILDING BOARD MILLS
SIC 2661

Tar Paper Mfg.

benzopyrene (15)

Particle Board Mfg.

naphthalene (118)

BEET SUGAR
SIC 2063

acetic acid (3)

BROAD WOVEN FABRIC MILLS, WOOL
(Including Dyeing and Finishing)
SIC 2231

dieldrin (56)

4.3 Discussion of Results

Organic chemicals exist in drinking water and their presence may pose a health hazard. Specific characterization of a few drinking water systems has taken place in the last few years, with EPA studies of 90 cities currently in progress. Characterization of organics in industrial effluents, municipal effluents, rain water and surface waters has also been undertaken. The list of 154 organic compounds found in drinking waters, which was developed by examining published data, is by no means a total accounting. For example, the 89 compounds identified in New Orleans water represents only approximately 2% by weight of the total organics in the drinking water. In general, the 154 identified compounds are the fairly volatile organics with a molecular weight less than 250.

Section 4.2 of this report summarizes the probable industrial point sources for the various organic chemicals. The following sections discuss treatment sources, non-point sources, and biodegradability of these chemicals.

4.3.1 Compounds Not Industrially Manufactured

Table 4.3.1 lists 24 compounds for which no industrial manufacture or specific industrial use was identifed. However, all but two compounds can be directly or indirectly related to industrial sources. Thirteen of these compounds have been identified in industrial effluents or solid waste residues. Nine of the compounds have been indirectly related to industry as chlorinated derivatives of industrially important compounds. All the alkyl ethers, which are important solvents, cleaning agents, and pharmaceuticals, were reported as chlorine derivatives. The haloforms listed may be produced from industrial or naturally occurrring organics. No information was available for 2-methyoxy biphenyl or dihydrocarvone. Dihydrocarvone is a possible degradant or co-metabolite of carvone. 2-methoxy biphenyl may be formed from benzyl phenol during pH adjustment following chlorination.

There are indications that the methyl esters of lignoceric and behenic acid, methyl benzoate, methyl palmitate and methyl stearate identified in drinking water are usually present in acid form. The GC-MS method of analysis necessitates conversion of acid forms to esters, and thus could explain the identification of the ester forms as being present in drinking water.

Chloroethoxy ether and bromoform butanal may be incorrect designations and the trimethyl-trioxo-hexahydro-triazine isomer designation is insufficient for precise characterization.

Table 4.3.1

A. Organics With No Specific Industrial Manufacture or Use

Compounds	Possible Sources
benzopyrene (15)	petroleum and coal wastes
benzothiophene (17)	coke wastes
thiomethylbenzothiazole (141)	petroleum and coal wastes
methyl biphenyl (106)	petroleum and coal wastes
methyl benzothiazole (105)	petroleum and coal wastes
1-isopropenyl-4-isopropyl benzene (97)	petroleum wastes
(deethyl) atrazine (9)	pesticide mfg. waste and degradation of atrazine
DDE (44)	pesticide mfg. waste and degradation of DDT
1,2,3,4,5,7,7-heptachloronorbornene (86)	pesticide mfg. waste
trimethyl-trioxo-hexahydro-triazine isomer (150)	pesticide mfg. waste and degradation of s-triazine pesticides
2-hydroxyadiponitrile (92)	adiponitrile mfg. waste
cis and trans-2-ethyl-4-methyl-dioxolane (80 and 81)	fiberglass mfg. waste

B. Possible Chlorinated Derivatives of Industrial Compounds

bromophenyl phenyl ether (25)	diphenyl ether
b-chloroethyl methyl ether (35)	ethyl methyl ether
chloromethyl ether (39)	dimethyl ether
chloromethyl ethyl ether (40)	ethyl methyl ether
*bromodichloromethane (22)	methyl carbonyl organics
bromoform butanal (24)	methyl carbonyl organics
*dibromochloromethane (48)	methyl carbonyl organics
dibromodichloroethane (49)	ethylene, ethane
*1,1,3,3-tetrachloroacetone (136)	acetone

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*Compounds may be present in drinking water without upstream industrial discharges.

4.3.2 Compounds Which May Be Formed During Chlorination

Table 4.3.2 lists the compounds which may be produced during chlorination of drinking water. Several of these compounds have been directly related to chlorination processes. Compounds such as carbon tetrachloride and benzene hexachloride are not listed because the requirements for their formation are so rigorous that changes of formation during water treatment are negligible. Recent studies of chlorination (MCA 1972, Glaze 1975) have shown that most organic compounds may be chlorinated under treatment conditions. Aromatics, phenols, ethers, unsaturated alkanes, aldehydes, and ketones are readily attacked, and of these, phenol and benzene are especially succeptible. This may explain why these widely used materials have not been identified in drinking water while several chlorinated phenols and benzenes have been identified. Long chain saturated alkanes and esters are quite resistant to chlorination. Table 4.3.3 shows the chlorinated organics which result from chlorination of a variety of starting compounds. Many of these are not on the list of identified compounds but they are presented here as indications of the potential for formation of halogenated organics.

Table 4.3.2 Compounds Which May Be Formed by Chlorination

acetylene dichloride (6)
bromobenzene (20)
bromochlorobenzene (21)
bromodichloromethane (22)
bromoform (23)
bromoform butanal (24)
bromophenyl phenyl ether (25)
butyl bromide (27)
1,2-bis-chloroethoxy ethane (34)
b-chloroethyl methyl ether (35)
chloroform (36)
chlorohydroxy benzophenone (37)
bis-chloroisopropyl ether (38)
chloromethyl ether (39)
chloromethyl ethyl ether (40)
m-chloronitrobenzene (41)
3-chloropyridine (42)
dibromobenzene (47)
dibromochloromethane (48)
dibromodichloroethane (49)
1,4-dichlorobenzene (52)
dichlorodifluoroethane (53)
1,2-dichloroethane (54)
dichloroethyl ether (55)
hexachloro-1,3-butadiene (88)
hexachloroethane (90)
methyl chloride (108)
methylene chloride (117)
octyl chloride (124)
pentachlorobiphenyl (125)
1,1,3,3-tetrachloroacetone (136)
tetrachlorobiphenyl (137)
tetrachloroethane (138)
tetrachloroethylene (139)
trichlorobenzene (143)
trichlorobiphenyl (144)
1,1,2-trichloroethane (145)
1,1,2-trichloroethylene (146)
trichlorofluoromethane (147)
2,4,6-trichlorophenol (148)

Table 4.3.3 Starting Compounds and Possible Resultant Chlorination Products (MCA, 1972)

Starting Compound	Chlorinated Product
phenol	ortho and para-chlorophenol 2,4-dichlorophenol 2,6-dichlorophenol 2,4,6-trichlorophenol (148) non-aromatic oxidation products
m-cresol	2-chloro-3 -methylphenol 4-chloro-3-methylphenol 6-chloro-3-methylphenol 2,4-dichloro-3-methylphenol 2,6-dichloro-3-methylphenol 4,6-dichloro-3-methylphenol 2,4,6-trichloro-3-methylphenol non-aromatic oxidation products
hydroquinone	para-benzoquinone non-aromatic oxidation products
aniline	ortho and para-chloroaniline 2,4 and 2,6-dichloroaniline 2,4,6-trichloroaniline non-aromatic oxidation products
dimethylamine	n-chloro-dimethylamine oxidation products

4.3.3 Compounds Formed During Sewage Treatment

Biological degradation of waste waters during sewage treatment either completely or partically breaks down many organic compounds. Table 4.3.4 lists the compounds identified in drinking water which may be formed during biological activities in sewage. Variations in sewage treatment procedures affect the amount of organic compounds released to surface waters. Incineration or landfilling of sludges releases relatively small amounts of organics. However, sewer sludge digestion liquor may contain many organic compounds which are discharged with the liquor. When final effluents are chlorinated, some of the compounds listed in Table 4.3.2 may also be found. The differing chlorination conditions during sewage treatment result in the formation of fewer organic compounds than drinking water chlorination. Table 4.3.5 is a partial listing of compounds which have actually been identified in sewage treatment plant effluent.

Table 4.3.4 Compounds Which May Be Formed During the Biological Phase of Sewage Treatment

acetaldehyde (2)
acetic acid (3)
acetone (4)
acetophenone (5)
(deethyl) atrazine (9)
benzene (12)
benzoic acid (14)
borneol (19)
isoborneol (96)
carbon disulfide (30)
o-cresol (43)
2,4-dimethyl phenol (65)
2,6-dinitrotoluene (69)
ethanol (76)
ethyl amine (77)
methane (101)
methanol (102)
3-methyl butanal (107)
methyl ethyl ketone (109)
methyl phenyl carbinol (114)
2-methyl propanal (115)
methyl stearate (116)
pentanol (129)
propanol (132)
propylamine (133)
1-terpineol (135)
trimethyl-trioxo-hexahydro-triazine isomer (150)

Table 4.3.5 Compounds Positively Identified in Sewage Treatment Plant Effluents

acetone (4)
methylene chloride (117)
chloroform (36)
trichloroethane (145)
trichloroethylene (146)
tetrachloroethylene (139)
dichlorobenzene (52)
trichlorobenzene (143)
DDT (45)
trichlorobiphenyl (144)
tetrachlorobiphenyl (137)
pentachlorobiphenyl (125)
dieldrin (56)
benzene hexachloride (87)
DDE (44)
pentachlorophenol (126)
hexachloroethane (90)
toluene (142)
ethyl benzene (78)
indene (93)
benzoic acid (14)
phthalic anhydride (131)
o-cresol (43)

4.3.4 Organic Compounds as Refractory Human Metabolites

Few of the organic compounds identified in drinking water have been specifically related to human metabolite sources. However, there are many metabolic pathways common to humans, other animals and micro-organisms. The compounds which may be formed during biodegradation of organics in sewage or in landfills (Table 4.3.4) may be similarly degraded by human organisms, provided the right precursor is ingested. Specifically, barbital, acetaldehyde, acetic acid, acetone, ethanol, ethylamine, and 3-methyl butanal, are human metabolites which have been identified in drinking water. Barbital is a drug related biodegradant, and the others are metabolic intermediates obtained from a variety of substrates.

4.3.5 Landfill Leachate

It is difficult to characterize landfill leachate because uniform, representative samples are often difficult to obtain. In most instances, water percolates vertically through a landfill and the soils below until it reaches a water table or bedrock. Leachate which reaches bedrock flows downward along its surface and may then disappear through cracks in the bedrock, between layers of strata, or may eventually reach a water table or reappear on the surface.

Most leachate analysis has been accomplished on improperly operated landfills. For example, the leachate from an open dump with a slow moving streamlet passing through it has been characterized. Table 4.3.6 lists drinking water organics which have been identified in landfill leachate.

Table 4.3.6 Organic Compounds Identified in Landfill Leachate

* cresol (43)
* methyl naphthalene (112)
* dimethyl naphthalene (64)
* methyl biphenyl (106)
* diethyl phthalate (57)
* dibutyl phthalate (51)
di (2-ethylhexyl)phthalate (58)
decane (46)
docosane (72)
dodecane (73)
eicosane (74)
2-ethyl-n-hexane (79)
hexadecane (91)
isodecane (94)
nonane (121)
octadecane (122)
octane (123)
pentadecane (127)
pentane (128)
tetradecane (140)
tridecane (149)
undecane (152)
* benzothiazole (16)
camphor (28)
1-terpineol (135)
propylbenzene (134)
naphthalene (118)
ethyltoluene (82)
ethylbenzene (78)
dimethylphenol (65)
pentanol (129)
acetophenone (5)
benzopyrene (15)
butyl benzene (26)

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*Compounds identified in leachate from industrial waste landfill.

4.3.6 Typical Chemical Reactions in Air and Water

The atmosphere contains many reactive molecules (usually one to six carbon volatiles and their derivatives, and gaseous molecules such as Cl_2, F_2, Br_2, NO, NO_2. NH_3, H_2O, SO_2, etc.). With these substances, sunlight and other types of radiation, many organic compounds may be formed. The atmospheric mechanism is generally free radical. Free radical reactions with propanol will produce acetaldehyde and formaldehyde. Oxidation of propane and isobutane produces acetone. Oxidation of olefins produces methyl ethyl ketone, 2-methyl propanal, and other compounds. Alkyl radicals can undergo disproportionation and recombination reaction to form compounds such as formaldehyde, methane, methyl ethyl ether, and methanol. Formaldehyde and HCl in moist air will react to form chloromethyl ether. Atmospheric halogenations can form most of the halogenated compounds listed. These compounds may be "washed" from the atmosphere and reenter surface waters by rainfall and eventually reach drinking water supplies.

A common waterborne chemical reaction is chlorination of organics during sewage treatment or drinking water purification. However, chlorine disinfection is also an oxidative process. Oxidation by aqeuous hypochlorite, like chlorine substitution, does not occur readily with simple saturated aliphatic hydrocarbon chains. A point of attack is needed where some sort of substitution or unsaturation is already present. Alcoholic, aldehydic, carbohydrate types of materials, those for which hydrolysis to hydroxylated substances can take place and compounds with sulfhydryl groups or other reduced sulfur linkages are all classes of compounds subject to oxidation by aqueous hypochlorite. In addition to oxidation; there is the possibility of forming chlorinated oxidized products of this reaction especially if the oxidation of the organic compound is not complete to carbon dioxide, water and hydrochloric acid.

Other waterborne reactions include interaction with inorganics, such as heavy metals, condensations, rearrangements and hydrolysis on active surfaces of suspended particulates. Also, adsorption and absorption interactions occur on lipophilic surfaces.

4.3.7 Biodegradability

Table 4.3.7 summarizes the biodegradability of the organics studied in the present project. The refractory chemicals (category 5) include most of the highly chlorinated compounds and insecticides, heterocyclic and polynuclear ring compounds, and phthalate esters. These are not readily susceptible to biological treatment; they must be concentrated by physical-chemical methods and then incinerated, or otherwise properly disposed. These chemicals are carried into water supplies from diverse sources and by runoff (usually on particulate matter since most are lipophilic chemicals). Lagooning can be effective, though filtration and ozonolysis are preferred treatment methods for trace pollutants. Regulation of chemical use is a possible method of control; an example would be the use of biodegradable adipate ester plasticizers in place of the highly refractory phthalate esters now being used.

The rest of the chemicals (categories 1, 2, 3 and 4), including long chain alkanes, saturated hydrocarbons, alkyl and aryl esters, aliphatic amines, carboxylic acids, and alkyl aldehydes and ketones are susceptible to biodegradation in varying degrees. The category 4 compounds are very difficult to degrade and may require specially acclimated cultures or special environments. Nevertheless, biological treatment of these compounds is possible and would probably cost less than such physical-chemical treatments as carbon adsorption or combined filtration and ozonolysis. These compounds are resistant enough to pass through a normal municipal waste treatment system in appreciable amounts. The remaining compounds are biodegradable in varying degrees.

A number of factors affect biodegradability in any natural environment; these include such extrinsic factors as moisture, pH, and degree of aeration but also the intrinsic factors like chemical structure and water solubility. No single system of classification will apply in all cases because so much depends on adaptation of the receiving environment. If soil, sewage, or natural waters receive consistent dosages of the chemicals so that an acclimated microbial flora develops, degradation may be fairly rapid even for compounds that would otherwise be classed as "difficult to degrade". The ease with which an acclimatized environment is established (or the extent of the lag before active degradation begins) is, therefore, another important factor.

An example of this situation can be found in reference 196. Acetone in both acclimated and unacclimated sludge is rapidly biodegraded. Ethylene glycol, however, has varying patterns of biodegradability depending on whether it is in an acclimated or unacclimated environment. If one were to rely only on 5-day BOD data with unacclimated microorganisms, it appears that ethylene glycol may not be as readily degraded as acetone. However, after 16 days of incubation, the reverse appears to be true. Both compounds are actually in category 1 (easily biodegraded). It should be noted that for some other chemicals, weeks or months are required to build up acclimatized environments at which point biodegradation is facilitated.

With respect to organic compounds in general, degradation will occur most rapidly in sewage and least rapidly in water, where the rates will be limited by concentration of microorganisms, low temperatures, and sometimes availability of accessory nutrients such as phosphorus.

Table 4.3.7 Biodegradability of Organics Identified in Drinking Water

Refractory Compounds (Category 5)

aldrin (7)
benzopyrene (15)
benzothiazole (16)
benzothiophene (17)
benzyl butyl phthalate (18)
bromochlorobenzene (21)
bromoform butanal (24)
bromophenyl phenyl ether (25)
chlordane (32)
chlorohydroxy benzophenone (37)
bis-chloroisopropyl ether (38)
m-chloronitrobenzene (41)
DDE (44)
DDT (45)
dibromobenzene (47)
dibutyl phthalate (51)
1,4-dichlorobenzene (52)
dichlorodifluoroethane (53)
dieldrin (56)
diethyl phthalate (57)
di (2-ethylhexyl) phthalate (58)
dihexyl phthalate (59)
di-isobutyl phthalate (62)
dimethyl phthalate (66)
4,6-dinitro-2-aminophenol (68)
dipropyl phthalate (71)
endrin (75)
heptachlor (84)
heptachlor epoxide (85)
1,2,3,4,5,7,7-heptachloronorbornene (86)
hexachlorobenzene (87)
hexachloro-1, 3-butadiene (88)
hexachlorocyclohexane (89)
hexachloroethane (90)
methyl benzothiazole (105)
pentachlorobiphenyl (125)
pentachlorophenol (126)
1,1,3,3-tetrachloroacetone (136)
tetrachlorobiphenyl (137)
thiomethylbenzothiazole (141)
trichlorobenzene (143)
trichlorobiphenyl (144)
trichlorofluoromethane (147)
2,4,6-trichlorophenol (148)
triphenyl phosphate (151)
bromodichloromethane (22)
bromoform (23)
carbon tetrachloride (31)
chloroform (36)
chloromochloromethane (48)
dibromodichloroethane (49)
tetrachloroethane (138)
1,1,2-trichloroethane (145)

Table 4.3.7 Biodegradability of Organics Identified in Drinking Water - continued

Very Difficult to Degrade Compounds (Category 4)

acenaphthylene (1)
atrazine (8)
(deethyl) atrazine (9)
barbital (10)
borneol (19)
bromobenzene (20)
camphor (28)
chlorobenzene (33)
1,2-bis-chloroethoxy ethane (34)
b-chloroethyl methyl ether (35)
chloromethyl ether (39)

chloromethyl ethyl ether (40)
3-chloropyridine (42)
di-t-butyl-p-benzoquinone (50)
dichloroethyl ether (55)
dihydrocarvone (60)
dimethyl sulfoxide (67)
2,6-dinitrotoluene (69)
cis-2-ethyl-4-methyl-1,3-dioxolane (80)
trans-2-ethyl-4-methyl-1,3-dioxolane (81)
guaiacol (83)
2-hydroxyadiponitrile (92)
isophorone (95)
indene (93)
isoborneol (96)
isopropenyl-4-isopropyl benzene (97)
2-methoxy biphenyl (103)
methyl biphenyl (106)
methyl chloride (108)
methylindene (111)
methylene chloride (117)
nitroanisole (119)
nitrobenzene (120)
tetrachloroethylene (139)
1,1,2-trichloroethylene (146)
trimethyl-trioxo-hexahydro-triazine isomer (150)

Difficult to Degrade Compounds (Category 3)

acetylene dichloride (6)
behenic acid, methyl ester (11)
benzene (12)
benzene sulfonic acid (13)
butyl benzene (26)
butyl bromide (27)
e-caprolactam (29)
carbon disulfide (30)
o-cresol (43)
decane (46)
1,2-dichloroethane (54)
1,2-dimethoxy benzene (63)
1,3-dimethyl naphthalene (64)
1,4-dimethyl phenol (65)
dioctyl adipate (70)
n-dodecane (73)
ethyl benzene (78)
2-ethyl-n-hexane (79)
o-ethyltoluene (82)
isodecane (94)
isopropyl benzene (98)
limonene (99)
methyl ester of lignoceric acid (100)
methane (101)
2-methyl-5-ethyl-pyridine (110)
methyl naphthalene (112)
methyl palmitate (113)
methyl phenyl carbinol (114)
methyl stearate (116)
naphthalene (118)
nonane (121)
octane (123)
octyl chloride (124)
pentane (128)
phenyl benzoate (130)
phthalic anhydride (131)
propylbenzene (134)
1-terpineol
toluene (142)
vinyl benzene (153)
xylene (154)

Table 4.3.7 Biodegradability of Organics Identified in Drinking Water - continued

Compounds Degraded Without Much Difficulty (Category 2)

acetophenone (5)
benzoic acid (14)
di-isobutyl carbinol (61)
docosane (72)
eicosane (74)
ethylamine (77)
hexadecane (91)
methanol (102)
methyl benzoate (104)
3-methyl butanal (107)
2-methylpropanol (115)
octadecane (122)
pentadecane (127)
propylamine (133)
tetradecane (140)
n-tridecane (149)
n-undecane (152)

Easily Degraded Compounds (Category 1)

acetaldehyde (2)
acetic acid (3)
acetone (4)
ethanol (76)
methyl ethyl ketone (109)
pentanol (129)
propanol (132)

APPENDIX A

ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATERS IN THE U.S. (AS OF 11/25/74), U. S. ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO

APPENDIX A

"Organic Compounds Identified in Drinking Waters in the
U.S. (as of 11/25/74)," U.S. Environmental Protection
Agency, Cincinnati, Ohio

acenaphthylene (1)
acetaldehyde (2)
acetic acid (3)
acetone (4)
acetophenone (5)
acetylene dichloride (6)
aldrin (7)
atrazine (8)
(deethyl) atrazine (9)
barbital (10)
behenic acid, methyl ester (11)
benzene (12)
benzene sulfonic acid (13)
benzoic acid (14)
benzopyrene (15)
benzothiazole (16)
benzothiophene (17)
benzyl butyl phthalate (18)
borneol (19)
bromobenzene (20)
bromochlorobenzene (21)
bromodichloromethane (22)
bromoform (23)
bromoform butanal (24)
bromophenyl phenyl ether (25)
~~butanone~~ (same as 109)
butyl benzene (26)
butyl bromide (27)
~~oxo-2-camphanol~~ (same as 96)
camphor (28)
e-caprolactam (29)
carbon disulfide (30)
carbon tetrachloride (31)
chlordane (32)
chlorobenzene (33)
~~chlorodibromomethane~~ (same as 48)
1,2-bis-chloroethoxy ethane (34)
~~chloroethoxy-ether~~ (incomplete characterization)
~~bis-2-chloroethyl ether~~ (same as 55)
b-chloroethyl methyl ether (35)
chloroform (36)
chlorohydroxy benzophenone (37)
bis-chloroisopropyl ether (38)
chloromethyl ether (39)
chloromethyl ethyl ether (40)
m-chloronitrobenzene (41)
3-chloropyridine (42)
o-cresol (43)
DDE (44)
DDT (45)
decane (46)
dibromobenzene (47)
dibromochloromethane (48)
dibromodichloroethane (49)
di-t-butyl-p-benzoquinone (50)
dibutyl phthalate (51)
1,4-dichlorobenzene (52)
dichlorodifluoroethane (53)
1,2-dichloroethane (54)
dichloroethyl ether (55)
~~dichloromethane~~ (same as 117)
dieldrin (56)
diethyl phthalate (57)
di (2-ethylhexyl) phthalate (58)
dihexyl phthalate (59)
dihydrocarvone (60)
di-isobutyl carbinol (61)
di-isobutyl phthalate (62)
1,2-dimethoxy benzene (63)
~~dimethyl benzene~~ (same as 154)
1,3-dimethyl naphthalene (64)
2,4-dimethyl phenol (65)
dimethyl phthalate (66)
dimethyl sulfoxide (67)
4,6-dinitro-2-aminophenol (68)
2,6-dinitrotoluene (69)
dioctyl adipate (70)
dipropyl phthalate (71)
docosane (72)

"Organic Compounds Identified in Drinking Waters in the U.S. (as of 11/25/74)", U. S. Environmental Protection Agency, Cincinnati, Ohio (continued)

n-dodecane (73)
eicosane (74)
endrin (75)
ethanol (76)
ethylamine (77)
ethyl benzene (78)
2-ethyl-n-hexane (79)
cis-2-ethyl-4-methyl-1, 3-dioxolane (80)
trans-2-ethyl-4-methyl-1, 3-dioxolane (81)
o-ethyltoluene (82)
guaiacol (83)
heptachlor (84)
heptachlor epoxide (85)
1,2,3,4,5,7,7-heptachloronorbornene (86)
hexachlorobenzene (87)
hexachloro-1,3-butadiene (88)
hexachlorocyclohexane (89)
hexachloroethane (90)
hexadecane (91)
2-hydroxyadiponitrile (92)
indene (93)
isodecane (94)
isophorone (95)
isoborneol (96)
isopropenyl-4-isopropyl benzene (97)
isopropyl benzene (98)
limonene (99)
methyl ester of lignoceric acid (100)
p-~~menth-1-en-8-ol~~ (same as 135)
methane (101)
methanol (102)
2-methoxy biphenyl (10
methyl benzoate (104)
methyl benzothiazole (105)
methyl biphenyl (106)
3-methyl butanal (107)
methyl chloride (108)
methyl ethyl ketone (109)
2-methyl-5-ethyl-pyridine (110)
methylindene (111)
methyl naphthalene (112)
methyl palmitate (113)
methyl phenyl carbinol (1-phenylethanol) (114)
2-methylpropanal (115)
methyl stearate (116)
methylene chloride (117)
naphthalene (118)
nitroanisole (119)
nitrobenzene (120)
nonane (121)
octadecane (122)
octane (123)
octyl chloride (124)
pentachlorobiphenyl (125)
pentachlorophenol (126)
pentadecane (127)
pentane (128)
pentanol (129)
phenyl benzoate (130)
phthalic anhydride (131)
propanol (132)
propylamine (133)
propylbenzene (134)
1-terpineol (135)
1,1,3,3-tetrachloroacetone (136)

"Organic Compounds Identified in Drinking Waters in the U.S. (as of 11/25/74)", U.S. Environmental Protection Agency, Cincinnati, Ohio (continued)

tetrachlorobiphenyl (137)
tetrachloroethane (138)
tetrachloroethylene (139)
tetradecane (140)
thiomethylbenzothiazole (141)
toluene (142)
trichlorobenzene (143)
trichlorobiphenyl (144)
1,1,2-trichloroethane (145)
1,1,2-trichloroethylene (146)
trichlorofluoromethane (147)
~~trichloromethane~~ (same as 36)
2,4,6-trichlorophenol (148)
n-tridecane (149)
trimethyl-trioxo-hexahydro-triazine isomer (150)
triphenyl phosphate (151)
n-undecane (152)
vinyl benzene (153)
xylene (154)

APPENDIX B

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APPENDIX B

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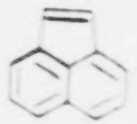
APPENDIX C

DATA DISPLAY

DATA DISPLAY

1. Chemical: acenaphthylene
   CAS Nomenclature: 83-32-9

2. Structure:



3. Class: unsubstituted aromatic

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining; shale oil processing; coal tar distilling.
      2. Users: Dye mfg.; plastics mfg.; insecticide and fungicide mfg.
      3. Gross estimate of annual discharge: 200 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Approximately 50% removed during traditional sewage treatment. Compound not likely formed during sewage treatment or solid waste disposal.
      2. Drinking water treatment (e.g., chlorination): Removal efficiency-low.
   C. Non-Point Source:
      1. Natural Coal tar.
      2. Chemical reactions None identified.
      3. Solid waste leachate Present in solid residues of petroleum and coal tar refining. Will gradually migrate through soils to ground water.
      4. Man caused non-point source Combustion of tobacco; constituent in asphalt.

5. Biodegradability (persistence): Moderately persistent; very difficult to degrade biologically (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: acetaldehyde
CAS Nomenclature:

2. Structure:

3. Class: aldehyde (alkane derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical mfg.

2. Users: Organic chemical mfg. (acetic acid, n-butanol, acetic anhydride, aldols, pentaerythritol etc.); perfumes, flavors, aniline dyes; plastics, synthetic rubbers mfg.; silvering mirrors; hardening gelatin fibers.

3. Gross estimate of annual discharge: 10,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Hydrocarbon and sewage degradation yields acetaldehyde, which in turn is readily degraded to CO_2 and H_2O. Decomposition of solid biological wastes produces acetaldehyde, which is readily metabolized by biological organisms.

2. Drinking water treatment (e.g., chlorination): Compound would not be produced as a result of drinking water treatment. Removal efficiency during water treatment approximately 50%.

C. Non-Point Source:

1. Natural: Metabolic intermediate in higher plants; alcoholic fermentation; sugar decomposition in body; by-product of most hydrocarbon oxidations.

2. Chemical reactions: Nitrogen oxides (air) + Hydrocarbons (aromatic & aliphatic) $\xrightarrow{\text{light}}$ aldehydes $\xrightarrow{H_2O}$ aldehyde (aq.)

3. Solid waste leachate: Compound will leach from biological disposal areas, landfilled sludges where acetaldehyde is unrecovered; should be efficiently degraded during migration through soils.

4. Man caused non-point source: Vehicle exhaust; open burning and incineration of gas, fuel, oil and coal, evaporation of perfumes, lab use.

5. Biodegradability (persistence): Readily biodegraded in soils, sewage, natural water systems (category 1).

6. Effective treatment method: Biological treatment (95%).

DATA DISPLAY

1. Chemical: acetic acid
   CAS Nomenclature: 64-19-7

2. Structure:

3. Class: carboxylic acid

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Beetsugar mfg.; winery; vinegar mfg; textile mills; wood distillation plants.
      2. Users: Food processing plants; organic chemical mfg; nylon and fiber mfg; dyestuff and pigments mfg; vitamins, antibiotics, hormones mfg; rubber mfg; photographic chemicals mfg; mfg. ester solvents; mfg. plastics.
      3. Gross estimate of annual discharge: 30,000 tons (method 1).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Biological sewage treatment produces acetic acid which is readily degraded. Decomposition of solid biological wastes produces acetic acid which is readily metabolized by living organisms.
      2. Drinking water treatment (e.g., chlorination): Compound would not be produced as a result of drinking water treatment. Removal efficiency during drinking water treatment approximately 50%.
   C. Non-Point Source:
      1. Natural: Both plants and animals as normal metabolite.
      2. Chemical reactions: Acetaldehyde $\xrightarrow{(O_2)}$ acetic acid; acetone $\xrightarrow{(O_2)}$ acetic acid.
      3. Solid waste leachate: Compound will leach from biological disposal areas, should be efficiently degraded during migration through soils.
      4. Man caused non-point source: Domestic use of vinegar; photographic film developing, lab use.

5. Biodegradability (persistence): Readily biodegraded in soils, sewage, natural water systems. (category 1).

6. Effective treatment method: Biological treatment (>95%).

DATA DISPLAY

1. Chemical: acetone
CAS Nomenclature: 67-64-1

2. Structure:

3. Class: ketone (alkane derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. smokeless powder; paints, varnishes, lacquers mfg.; organic chemical mfg.; pharmaceuticals mfg; sealants and adhesives mfg; solvents for cellulose acetate, nitrocellulose, acetylene; formulation and packaging of products.

3. Gross estimate of annual discharge: 40,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): During biological treatment of sewage, acetone is a decomposition intermediate which is readily degraded in efficient systems. Operation of sewage treatments over optimal capacity increases the potential for acetone discharge. Decomposition of solid wastes (biological) produces acetone which is in turn readily degraded air emissions due to incineration of sludges/slurries containing acetone. Combustion efficiency is greater than 99.99%. Presence of other waste slurry/sludge constituents can decrease this efficiency.
Surface spreading of waste slurries/sludges containing acetone residuals (less than 1-10%) will release acetone to soils. Most (approx. 80%) will be released to atmosphere where it will be available for photochemical reactions or will be returned to waterways by rain.

2. Drinking water treatment (e.g., chlorination): Compound would be product as a result of traditional drinking water purification procedures, (removal efficiency during water treatment ~40%).

C. Non-Point Source:

1. Natural: Normal microcomponent in blood and urine; minor constituent in pyroligneous acid; biodegradation: intermediate in isopropanol breakdown; oxidation of alcohols and humic substances.

2. Chemical reactions: Oxidation of propane; oxidation of isobutane; photooxidation of isobutylene.

3. Solid waste leachate: Compound may leach from biological disposal areas, landfilled sludges in which acetone was a process solvent or unrecovered reactant, acetone is readily degraded during migration through soils, however, the presence of other constituents in industrial waste leachate would affect biodegradability, generally reducing efficiency of biodegradation.

4. Man caused non-point source: General laboratory use (>80% loss to water and air), evaporation from applied paints and coatings and other acetone containing formulations, return to water with rain).

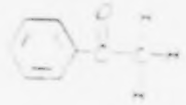
5. Biodegradability (persistence): Low persistence (generally completely degraded in 1-2 months) (category 1).

6. Effective treatment method: Biological waste treatment (50%); activated carbon (90%).

DATA DISPLAY

1. Chemical: acetophenone
   CAS Nomenclature: 98-86-2

2. Structure:



3. Class: ketone (aryl alkane derivative)

4. Sources:

   A. Industry Point Source (Water and Air)

      1. Manufacturers: Organic chemical industry; coal processing industry.

      2. Users: Perfume mfg; solvent for synthesis of pharmaceuticals, rubber, chemicals, dyestuffs and corrosion inhibitors; plasticizer mfg; tobacco flavorant; intermediate in synthesis of pharmaceuticals.

      3. Gross estimate of annual discharge: 50 tons (method 2).

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): Sewage treatment of long chain aryl alkyl ketones can produce acetophenone. Combustion of coal tar residues releases acetophenone to the air. Operation of sewage plant above capacity releases acetophenone. Decomposition of land disposed organics (such as phenyl methyl carbinol) produces acetophenone.

      2. Drinking water treatment (e.g., chlorination): Could be produced, depending on the degree of oxidation of phenyl methyl carbinol.

   C. Non-Point Source:

      1. Natural: Oils of castoreum and labdanum resin; buds of balsam poplar; heavy oil fraction of coal tar.

      2. Chemical reactions: None identified.

      3. Solid waste leachate: Present in leachate in solid waste in which acetophenone was a process solvent/unrecovered reactant.

      4. Man caused non-point source: Lab chemical use; vaporization from perfumes.

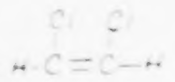
5. Biodegradability (persistence): Moderate in sewage solids, not water (1 month) (category 2).

6. Effective treatment method: Lagooning (70%); activated sludge (90%); activated carbon (99%); water purification (50%).

DATA DISPLAY

1. **Chemical:** acetylene dichloride
CAS Nomenclature: 540-59-0

2. **Structure:**



$\mathrm{H-\overset{Cl}{\overset{|}{C}}=\overset{Cl}{\overset{|}{C}}-H}$

3. Class: halogenated non-cyclic alkene

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemicals industry.

2. Users: Solvent for fats, phenols, camphor, etc; retard fermentation; rubber mfg; refrigerant; additive to dye and lacquer solutions; low temperature solvent for heat sensitive substances (e.g., caffeine); constituent of perfumes, thermoplastic ; used in organic synthesis and medicine.

3. Gross estimate of annual discharge: 100 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during biological treatment phase, formed during chlorination of final effluent.

2. Drinking water treatment (e.g., chlorination): Results from chlorination (trace).

C. Non-Point Source:

1. Natural None

2. Chemical reactions Ethylene + chlorine or hypochlorous acid → acetylene dichloride

3. Solid waste leachate Would leach from landfilled sewage if already present; would not be expected to form during degration of solid waste.

4. Man caused non-point source Evaporation from dyes, coatings, perfumes; use of solvents, refrigerants; laboratory use and medical use.

5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

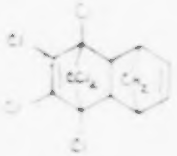
6. Effective treatment method: Sewage treatment (20%); drinking water treatment - before chlorination (20%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: aldrin

CAS Nomenclature: 309-00-2

2. Structure:



3. Class: halogenated cyclic alkene

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Pesticide mfg.

2. Users: Insecticide.

3. Gross estimate of annual discharge: Less than 1 ton (method 5).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage sludge, industrial sludges and slurries).

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural None

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes of which it is a constituent.

4. Man caused non-point source Agricultural runoff, lab use.

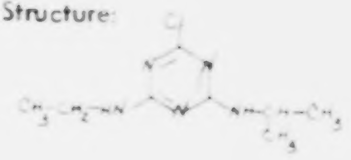
5. Biodegradability (persistence): Persistent: approximately 3 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (~50%).

DATA DISPLAY

1. Chemical: atrazine
   CAS Nomenclature:

2. Structure:



3. Class: heterocyclic amine

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: herbicide mfg.
     2. Users: Agricultural industry (herbicide, plant growth regulator)
     3. Gross estimate of annual discharge: Less than one ton (method 5).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not produced as a result of decomposition of sewage or solid waste components. Incineration is approximately 99% effective in removal.
     2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   - C. Non-Point Source.
     1. Natural: None.
     2. Chemical reactions: None identified.
     3. Solid waste leachate: Solid slurries and sludges from atrazine mfg. will leach atrazine.
     4. Man caused non-point source: Agricultural runoff, lab use.

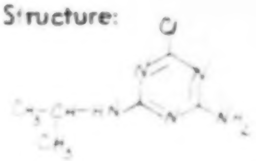
5. Biodegradability (persistence): Stable. Complete decomposition requires months (estimated): in soils, approx. 17 months (Category 4).

6. Effective treatment method: Incineration (99%); activated carbon (90%).

DATA DISPLAY

1. Chemical: (deethyl) atrazine
CAS Nomenclature:

2. Structure:



3. Class: heterocyclic amine

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Pesticide mfg. (minor constituent in atrazine).

2. Users: None

3. Gross estimate of annual discharge: Less than one ton (method 5).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): During biological treatment of sewage and solid wastes, deethyl atrazine is expected to be formed.

2. Drinking water treatment (e.g., chlorination): Not expected to be formed.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Atrazine + water + light → (deethyl) atrazine.

4. Man caused non-point source Water-borne atrazine in presence of light eventually produces deethyl atrazine. Also biodegradant of atrazine.

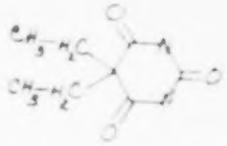
5. Biodegradability (persistence): No information (category 4 (est.)).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: barbital
CAS Nomenclature: 57-44-3

2. Structure:



3. Class: heterocyclic amine

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Pharmaceutical mfg.

2. Users: Medicine mfg.; stabilizer for hydrogen peroxide; mfg. of other pharmaceuticals.

3. Gross estimate of annual discharge: 300 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not expected to be produced as result of decomposition of sewage/solid waste.

2. Drinking water treatment (e.g., chlorination): Not expected to be produced.

C. Non-Point Source:

1. Natural None

2. Chemical reactions None identified.

3. Solid waste leachate Potential leachate from pharmaceutical solid wastes containing barbitol.

4. Man caused non-point source General use of medicinal, experimental use.

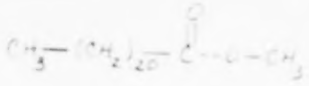
5. Biodegradability (persistence): Persistent (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: methyl ester of behenic acid
CAS Nomenclature: 929-77-1

2. Structure:



$CH_3-(CH_2)_{20}-\overset{O}{\overset{\|}{C}}-O-CH_3$

3. Class: alkyl ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Mfg. and processing of carnauba wax; seed oil processing and refining; natural product industry.

2. Users: Reference standard for gas chromatography in biochemical and medical research; special synthesis intermediate for pure behenic acid.

3. Gross estimate of annual discharge: 100 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not expected to be produced during biological decomposition of sewage/solid wastes.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Minor constituent of most seed fasts, animal milk fats, and marine animal oils.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach in small quantities from decomposing biological wastes.

4. Man caused non-point source Water-borne discharge of foods, such as milk, and of domestic sewage, lab use.

5. Biodegradability (persistence): Moderately persistent. Approx. 3-6 months to completely degrade (category 3).

6. Effective treatment method: Biological (90%).

DATA DISPLAY

1. Chemical: benzene
   CAS Nomenclature: 71-43-2

2. Structure:

3. Class: unsubstituted aromatic

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refinery; solvent recovery plant; coal tar distillation coal processing; coal coking
      2. Users: Mfg. styrene; phenol mfg.; nylon intermediates; detergents mfg.; organic chemicals mfg.; pesticide mfg.; plastics and resins mfg.; synthetic rubber mfg.; aviation fuel mfg.; food processing; pharmaceuticals mfg.; dye mfg.; explosives mfg.; photographic chemicals; PCB mfg.; gasoline mfg.; tanning, flavors and perfumes mfg.; paints and coatings mfg.
      3. Gross estimate of annual discharge: 100,000 tons (method 1).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): During biological treatment of complex organics, benzene is an intermediate which is readily degraded in efficient systems. Surface spreading of sludges/slurries containing benzene releases it to the air Incineration of sludges/slurries containing it will release small quantities.
      2. Drinking water treatment (e.g., chlorination): Not expected to be produced.
   C. Non-Point Source:
      1. Natural Petroleum oils, coal tars.
      2. Chemical reactions None identified
      3. Solid waste leachate Present in landfill sludges where it was a process solvent or unrecovered reactant. Can be degraded during soil migration.
      4. Man caused non-point source General lab use (loss > 80% to water or air) evaporation from applied paints and coatings, perfumes, dyes and pesticides.

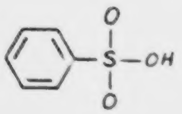
5. Biodegradability (persistence): Difficult to biodegrade (other constituents will affect biodegradability) (category 3).

6. Effective treatment method: Biological (90-100%); activated carbon (90-100%); incineration (greater than 99.99%).

DATA DISPLAY

1. Chemical: benzene sulfonic acid
   CAS Nomenclature: 98-11-3

2. Structure:



3. Class: sulfonic acid

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining.
      2. Users: Dye mfg. (intermediate); accelerator in alkyol resin formation; phenol mfg (intermediate); mfg resorcinol (intermediate).
      3. Gross estimate of annual discharge: 600 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not expected to be formed during sewage treatment/solids disposal.
      2. Drinking water treatment (e.g., chlorination): Not expected to be formed.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions None identified.
      3. Solid waste leachate Potential leachate from solid waste containing compound; in sludges/slurries as unrecovered product/reactant.
      4. Man caused non-point source None. No general use of chemical except in labs.

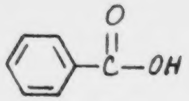
5. Biodegradability (persistence): Difficult to degrade (category 3).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: benzoic acid
CAS Nomenclature: 65-85-0

2. Structure:



3. Class: carboxylic acid

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Food preservative; pharmaceutical and cosmestic preparations, preservatives, ointment, and local anaesthetics mfg.; mfg. of alkyd resins; intermediate in the synthesis of dyestuffs and pharmaceuticals; production of phenol and caprolactam; plasticizer mfg. (to modify resins - PVC, PV acetate, phenol-formaldehyde).

3. Gross estimate of annual discharge: 1,000 tons (method 2).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Biological sewage treatment produces benzoic acid which readily decomposes. Decomposition of solid biological wastes produces it, which is then readily metabolized. Decomposition of industrial sludges/slurries from above identified users produces it.

2. Drinking water treatment (e.g., chlorination): Potentially produced during drinking water treatment.

C. Non-Point Source:
1. Natural Cranberries, prunes, ripe cloves, bark of wild black cherry tree, scent glands of beavers, and oil of anise seed. Derivatives are widely distributed (gum bensoin - up to 20%; acaroid resin 4-7%); glycine derivative (hippuric acid) found in urine of herbivorous animals. Forest runoff.
2. Chemical reactions None identified.
3. Solid waste leachate Present in leachate from biological solid waste and industrial sludges/slurries where it is an unreacted reactant.
4. Man caused non-point source Constituent in domestic waste. General use of pharmaceuticals, cosmetics, food. Decomposition of plastics and resins. Lab use.

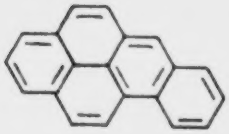
5. Biodegradability (persistence): Biodegradable. Approx. 1-2 months for complete degradation of other items cause it to be virtually ever present in water (category 2).

6. Effective treatment method: Biological (95-100%).

DATA DISPLAY

1. Chemical: benzopyrene
CAS Nomenclature: 50-32-8

2. Structure:



3. Class: unsubstituted aromatic

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Coal tar processors; petroleum refining; shale refining; processors coal and coke; kerosene processing; heat and power generation sources.

2. Users: Used only as a constituent in coal, petroleum, shale and kerosene.

3. Gross estimate of annual discharge: 60 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Incineration (enclosed and open) of refuse. Not formed during biological decomposition of sewage/solid waste. Incineration of coal, petroleum products releases it to air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural Coal tar, tobacco.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from waste sludges/slurries from coal, petroleum, shale, and coke refining.

4. Man caused non-point source Combustion of tobacco, combustion of fuels. Present in run off containing greases, oils, etc. Potential roadbed and asphalt leachate.

5. Biodegradability (persistence): Persistent chemical (category 5).

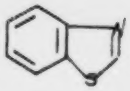
6. Effective treatment method: Activated carbon (greater than 90%).

DATA DISPLAY

1. Chemical: benzothiazole

CAS Nomenclature: 95-16-9

2. Structure:



3. Class: benzothiazole

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical mfg.

2. Users: Photographic dye mfg; rubber chemicals mfg.

3. Gross estimate of annual discharge: 300 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment/solid waste disposal.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Potentially from sludges/slurries in which it is unrecovered reactant or product.

4. Man caused non-point source General photographic use. Potentially present in roadway runoff as result of tire wear. Lab use.

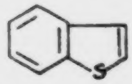
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: benzothiophene
   CAS Nomenclature: 95-15-8

2. Structure:



3. Class: mercaptans and other sulfur organics

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Processing lignite tars.
      2. Users: Present as minor contaminant in coal products.
      3. Gross estimate of annual discharge: 30 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage/solids treatment. Incinceration of coal and coal wastes release small quantities to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced.
   C. Non-Point Source:
      1. Natural Coal (lignite).
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from coal-processing residue.
      4. Man caused non-point source General use of petroleum distillates.

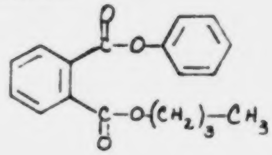
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (80-100%).

DATA DISPLAY

1. Chemical: benzyl butyl phthalate
   CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Organic chemical industry.
     2. Users: Plasticizer mfg; plastics mfg, processing, and recycling.
     3. Gross estimate of annual discharge: 100 tons (method 7).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal, released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production, and other manufacturing processes above.
     2. Drinking water treatment (e.g., chlorination): not formed during drinking water treatment.
   - C. Non-Point Source:
     1. Natural None.
     2. Chemical reactions None identified.
     3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
     4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

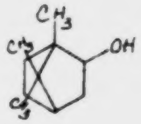
5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90–100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: borneol
CAS Nomenclature: 507-70-0

2. Structure:



3. Class: alcohol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; extraction and recovery from certain woods.

2. Users: Frother (flotation agent); textile industry (wet processing of cotton, silk, rayon, wool); soap mfg. (solvent and bactericide); preservative for casein and other proteins in water paints; mfg. of camphor; perfume and incense mfg.; mfg. of chemical esters; mfg. of flavorings and medicinals.

3. Gross estimate of annual discharge: 1,000 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Expect sewage treatment and solid waste decomposition to form small quantities. Air: surface spreading of sludges/slurries containing borneol will result in its evaporation into the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural Pine oil component (tree stumps); normal component of forest runoff.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal waste, biological waste (such as trees) sludges/slurries where compound is unrecovered reactant in above industries.

4. Man caused non-point source General use of soaps, paints, perfumes and flavors; evaporation from perfumes. Lab use.

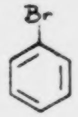
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Biological treatment; activated carbon.

DATA DISPLAY

1. Chemical: bromobenzene
CAS Nomenclature: 108-86-1

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Solvent (fats, waxes, or resins); intermediates in specialty organic chemicals synthesis; additive to motor oil and fuels.

3. Gross estimate of annual discharge: 200 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Formed in small quantities during chlorination of sewage effluent.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Phenyl radical + bromine → bromobenzene + chlorine radical; benzene + HOBr → bromobenzene + water

3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.

4. Man caused non-point source General lab use; use as solvent; discharge of waste motor oils to water; road surface runoff.

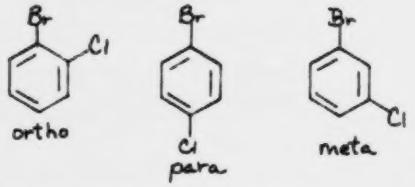
5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: bromochlorobenzene
CAS Nomenclature: 106-39-8

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Intermediate in synthesis of organic compounds.

3. Gross estimate of annual discharge: 300 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Formed in small quantities during chlorination of sewage effluent. Small quantities released during sludges/slurries of which it is a constituent, and small quantities released to air during surface spreading of same.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during drinking water chlorination.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Phenyl radical + chlorine + bromine → bromochlorobenzene; benzene + HOCl + HOBr → bromochlorobenzene + water

3. Solid waste leachate Will leach from sludges/slurries in which it is a component.

4. Man caused non-point source General laboratory use.

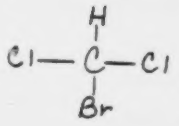
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: bromodichloromethane
CAS Nomenclature: 75-27-4

2. Structure:



$CHBrCl_2$

3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Fire-extinguisher fluid ingredient; solvent (fats, waxes, resins); synthesis intermediate; heavy liquid for mineral and salt separations.
      3. Gross estimate of annual discharge: 300 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluents. Not formed during biological phase of sewage treatment, biological degradation of solid wastes, or incineration of municipal refuse or industrial sludges and slurries.
      2. Drinking water treatment (e.g., chlorination): Results from chlorination of finished water; not formed in prior purification steps.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) Methyl radical + chlorine + bromine → bromodichloromethane (Water) methyl carbonyl or hydroxy organics + HOBr + HOCl → bromodichloromethane + water + organic acid.
      3. Solid waste leachate Will leach from industrial waste sludges and slurries of which it is an ingredient.
      4. Man caused non-point source Use of fire estinguishers; constituent in municipal sewage; general use of chlorinated water, lab use.

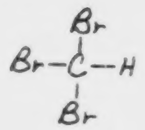
5. Biodegradability (persistence): Refractory (Category 5).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: bromoform
CAS Nomenclature: 75-25-2

2. Structure:



$$\mathrm{Br-\overset{\displaystyle Br}{\underset{\displaystyle Br}{C}}-H}$$

3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Pharmaceutical mfgs. (sedative antitussive); ingredient in fire-resistant chms; gage fluid; heavy liquid in solid separations based on differences in specific gravity, geological assaying, solvent for waxes, greases and oils.
      3. Gross estimate of annual discharge: 2,000 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluents. Not formed during biological phase of sewage treatment, biological degradation of solid wastes or incineration of municipal refuse or industrial sludges and slurries.
      2. Drinking water treatment (e.g., chlorination): Results from chlorination of finished water; not formed in prior purification steps.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) Methyl radical + bromine → bromoform + hydrogenbromide (Water) methycarbonylor methyl hydroxyl organics + HOBr → bromoform + water + organic acids.
      3. Solid waste leachate Will leach from industrial waste sludges and slurries of which it is an ingredient. Lab use.
      4. Man caused non-point source Use of fire-resistant materials and their subsequent disposal

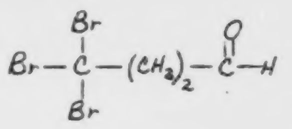
5. Biodegradability (persistence): Refractory (Category 5).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: bromoform butanal
   CAS Nomenclature:

2. Structure:

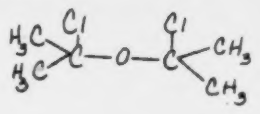


3. Class: halogenated aldehyde
4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: None identified.
      2. Users: None identified.
      3. Gross estimate of annual discharge: 1 ton or less (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed by biological treatment processes in sewage, biological, municipal, industrial waste decomposition or incineration of municipal or industrial wastes.
      2. Drinking water treatment (e.g., chlorination): Possibly formed during chlorination of finished water.
   C. Non-Point Source:
      1. Natural None identified.
      2. Chemical reactions Bromoform + acrolein → bromoform butanal
      3. Solid waste leachate None identified.
      4. Man caused non-point source General use of chlorinated water.
5. Biodegradability (persistence): Persistent (category 5).
6. Effective treatment method: Activated carbon (90–100%); aeration.

DATA DISPLAY

1. Chemical: bis-chloroisopropyl ether
   CAS Nomenclature:

2. Structure:



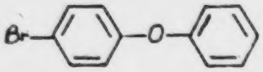
3. Class: halogenated ether
4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry. Constituent in waterborne wastes from propylene glycol manufacture.
      2. Users: Processing fats, waxes, greases; textiles mfg. cleaning solution mfg; intermediate in synthesis; extractant; paint and varnish; spotting agents.
      3. Gross estimate of annual discharge: 400 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, or by combustion of municipal or industrial wastes.
      2. Drinking water treatment (e.g., chlorination): May be formed during chlorination of drinking water.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) possible formation by halogenation of ethers formed photochemically from radicals. (Water) chlorination of appropriate ether.
      3. Solid waste leachate Compound will leach from municipal and industrial solids wastes of which it is a constituent.
      4. Man caused non-point source General use of chlorinated waters; potential constituent in domestic waste waters; use as a laboratory chemical; general use as a solvent; general use of paints, varnishes, cleaning solutions.
5. Biodegradability (persistence): Highly refractory to biological degradation. (category 5).
6. Effective treatment method: Activated carbon (90–100%).

DATA DISPLAY

1. Chemical: bromophenyl phenyl ether

CAS Nomenclature:

2. Structure:



3. Class: halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 3 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during biological activity in sewage sludge, solid wastes. Not formed during combustion of municipal or industrial wastes. Bromophenyl phenyl ether may be formed during chlorination of treated sewage.

2. Drinking water treatment (e.g., chlorination): Compound is formed during chlorination of drinking water.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Phenyl ether + HOBr → bromophenyl phenyl ether.

3. Solid waste leachate No information.

4. Man caused non-point source General use of chlorinated waters, potential constituent in domestic waste waters, use as a laboratory chemical.

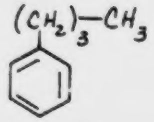
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: butyl benzene
CAS Nomenclature: 104-51-8

2. Structure:



3. Class: aryl alkane

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Petroleum refining.

2. Users: Organic synthesis; pesticide mfg.; solvent for coating compositions; plasticizer; surface-active agents; polymer linking agent; asphalt component; naphtha constituent.

3. Gross estimate of annual discharge: 1000 tons (method 7).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:
1. Natural Petroleum, coal.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: butylbromide
CAS Nomenclature:

2. Structure:
$CH_3-(CH_2)_3-Br$

3. Class: non-cyclic halogenated alkane

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Intermediate in synthesis of other products (alkylating agent).

3. Gross estimate of annual discharge: 1,000 tons (method 7).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluents. Not formed during biological phase of sewage treatment, biological degradation of solid wastes, or incineration of municipal refuse or industrial sludges and slurries.

2. Drinking water treatment (e.g., chlorination): Results from chlorination of finished water; not formed in prior purification steps.

C. Non-Point Source:
1. Natural None

2. Chemical reactions (Air) butyl radical + bromine → butylbromide; (Water) unsaturated alkane + HOBr → butyl bromide + water.
3. Solid waste leachate Will leach from industrial waste sludges and slurries of which it is present.
4. Man caused non-point source Constituent of municipal sewage; general use of chlorinated water. Lab use.

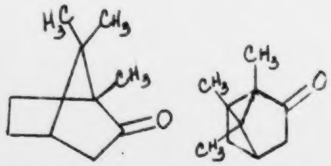
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: camphor
CAS Nomenclature:

2. Structure:



3. Class: ketone (cyclic alkane derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry; wood processing industry.
      2. Users: Odorant/flavorant in household, pharmaceutical and industrial products; plasticizer for cellulose esters and ethers; insect repellant (moths) and incense mfg.; lacquers and varnishes; explosives; embalming fluid; plastics mfg.; chemical intermediate.
      3. Gross estimate of annual discharge: 2,000 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Potential for formation from isoborneol during sewage treatment/disposal. Surface spreading of sludges/slurries containing camphor will result in its emission to the air.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural Major component of pine oil (leaves, twigs, stems of camphor tree of China, Formosa, Japan); present in forest runoff.
      2. Chemical reactions None identified.
      3. Solid waste leachate Leaches from municipal and biological wastes (such as trees) and sludges/slurries where compound is unrecovered reactant in above industries.
      4. Man caused non-point source General use of soaps, lacquers, varnishes, medicinals, insect repellant, embalming fluid discharged to municipal sewers. Lab use.

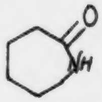
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Biological treatment; activated carbon.

DATA DISPLAY

1. Chemical: e-caprolactam
CAS Nomenclature: 105-60-2

2. Structure:



3. Class: amide

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Nylon mfg. and processing, mfg. of plastics, bristles, film, coatings, synthetic leather, plasticizers and paint vehicles, cross linking agent for curing polyurethanes; synthesis of amino acid lysine.

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during water treatment.

C. Non-Point Source:
1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Potential leachate from wastes in which compound is constituent.

4. Man caused non-point source General use of nylon products, certain plastics, application of paints and coatings.

5. Biodegradability (persistence): Difficult to degrade biologically (approximately 6 months-one year) (category 3).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: carbon disulfide
CAS Nomenclature:

2. Structure:

$S=C=S$

3. Class: mercaptans and other sulfur organics

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum and coal tar refining (minute amounts).

2. Users: Mfg. rayon, cellophane, carbon tetrachloride; mfg. rubber chemicals and flotation chemicals; mfg. soil disintectants; mfg. electronic vacuum tubes; solvent (phosphorus, sulfur, bromine, iodine, selenium, fats, resins, rubbers); mfg. grain fumigants, soil conditioners, herbicides; paper mfg (strength); pharmaceutical mfg (animals).

3. Gross estimate of annual discharge: 10,000 (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Biological degradation of various wastes will produce small quantities of carbon disulfide. Incineration of sulfur containing wastes (e.g., municipal refuse, sewage sludge, industrial wastes).

2. Drinking water treatment (e.g., chlorination): Not formed during water treatment.

C. Non-Point Source:

1. Natural Minor constituent in petroleum and coal.

2. Chemical reactions Carbon disulfide, formation due to soil organisms metabolizing nabam (fungicide).

3. Solid waste leachate Leaches from biological wastes.

4. Man caused non-point source General use as fumigant, degradation of rubber products. Lab use.

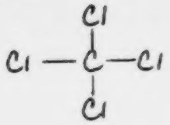
5. Biodegradability (persistence): Difficult to degrade biologically (6-12 months) (category 3).

6. Effective treatment method: Possibly activated carbon.

DATA DISPLAY

1. Chemical: carbon tetrachloride
   CAS Nomenclature: 56-23-5

2. Structure:



3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Fire extinguisher mfg; dry cleaning operations; mfg of refrigerants, aerosols, and propellants; mfg. of chlorofluoromethanes (80%); extractant; solvent; veterinary medicine; metal degreasing; fumigrant; chlorinating organic compounds.
      3. Gross estimate of annual discharge: 20,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Incineration of waste rubber could release small quantities to the air. Disposal of solvents or waste sludges/slurries would result in small quantities emitted to the air.
      2. Drinking water treatment (e.g., chlorination):
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) methyl radical + chlorine → carbon tetrachloride
      3. Solid waste leachate Would leach from municipal solid waste and other industrial solid wastes containing the compound.
      4. Man caused non-point source Fire extinguisher use, insecticide use, grain and soil fumigation use, general lab use.

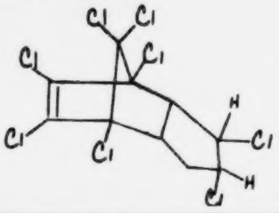
5. Biodegradability (persistence): Refractory (category 5)

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: chlordane
   CAS Nomenclature: 57-74-9

2. Structure:



3. Class: cyclic halogenated alkene

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide mfg.
      2. Users: Insecticide.
      3. Gross estimate of annual discharge: Less than 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage sludge, industrial sludges and slurries).
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes of which it is a constituent.
      4. Man caused non-point source Agricultural runoff. Lab use.

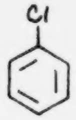
5. Biodegradability (persistence): Persistent: approximately 3 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (~50%).

DATA DISPLAY

1. Chemical: chlorobenzene
   CAS Nomenclature: 108-90-7

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Solvent recovery plants; intermediate in dyestuffs mfg.; mfg. aniline; insecticide mfg.; mfg. phenol, chloro nitrobenzene.
      3. Gross estimate of annual discharge: 4,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): May be produced in small quantities during chlorination of sewage. Not produced during biological sewage treatment or decomposition of solid wastes. Incineration of organic industrial wastes in which chlorobenzene is a constituent will release small quantities. Not released during incineration of municipal refuse.
      2. Drinking water treatment (e.g., chlorination): May be formed during chlorination of finished water.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions (Air) phenyl radical + chlorine → chlorobenzene + chlorine radical; (Water) benzene + HOCl → chlorobenzene + water.
      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
      4. Man caused non-point source General laboratory use; use as a solvent; general use of chlorinated water.

5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: 1,2-bis-chloroethoxy ethane
CAS Nomenclature: 112-26-5

2. Structure:

$Cl-CH_2-CH_2-O-CH_2-CH_2-O-CH_2-CH_2-Cl$

3. Class: halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Solvent for hydrocarbons, oils, etc; extractant; intermediate for resins and insecticides; organic synthesis.

3. Gross estimate of annual discharge: 30 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, by combustion of municipal or industrial wastes.

2. Drinking water treatment (e.g., chlorination): Possible creation during drinking water treatment by chlorination of diethoxyethane (acetal) which is used in medicine (hypnotic), cosmetics, flavors, and perfumes.

C. Non-Point Source:

1. Natural None

2. Chemical reactions (Air) possible formation by halogenation of ethers formed photochemically from radicals. (Water) acetal + HOCl → 1,2-bis-chlorothoxy ethane.

3. Solid waste leachate Compound will leach from municipal and industrial solid wastes of which it is a constituent.

4. Man caused non-point source General use of chlorinated waters; potential constituent in domestic waste waters; use as a laboratory chemical; general use as a solvent.

5. Biodegradability (persistence): Moderately persistent: (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: b-chloroethyl methyl ether

CAS Nomenclature:

2. Structure:

$CH_3-O-CH_2-CH_2-Cl$

3. Class: halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 10 tons or less (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, or by combustion of municipal or industrial wastes.

2. Drinking water treatment (e.g., chlorination): Formed during drinking water chlorination (possibly from ethyl methyl ether which is used as a medicine).

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) Possible formutation halogenation of ethers formed photochemically from radicals. (Water) ethyl methyl ether + HOCl → b-chloroethyl methyl ether + water.

3. Solid waste leachate No information.

4. Man caused non-point source General use of chlorinated water; potential constituent in domestic waste waters; use as a laboratory chemical.

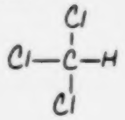
5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: chloroform
   CAS Nomenclature: 67-66-3

2. Structure:



$$\mathrm{Cl-\overset{Cl}{\underset{Cl}{C}}-H}$$

3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Mfg fluorocarbon refrigerants and propellants and plastics; mfg. anesthetics and pharmaceuticals, primary source for chlorodifluoromethane; fumigant; solvent; sweetener; fire extinguisher mfg; electronic circuitry mfg; analytical chemistry; insecticide.
      3. Gross estimate of annual discharge: 2,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluent prior to discharge.
      2. Drinking water treatment (e.g., chlorination): Results from chlorination.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) methyl radical + chlorine → chloroform; (Water) methyl carbonyl or methyl hydroxyl organics + HOCl → chloroform + water + organic acids.
      3. Solid waste leachate Would leach from industrial and municipal solid wastes, sludges, or slurries.
      4. Man caused non-point source Soil fumigation, use of fire extinguishers, pharmaceuticals, sweeteners, insecticides, fluorocarbon plastics. General lab use.

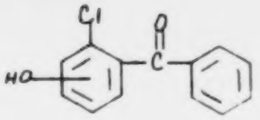
5. Biodegradability (persistence): Refractory (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: chlorohydroxy benzophenone
   CAS Nomenclature:

2. Structure:

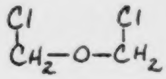


3. Class: halogenated ketone
4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Organic chemical industry.
     2. Users: Light absorber (optimum range 320-380 microns).
     3. Gross estimate of annual discharge: 10 tons or less (method 6)
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Probably not formed by biological activities in sewage sludge, solid wastes.
     2. Drinking water treatment (e.g., chlorination): Formed during chlorination process if hydroxybenzophenone is present.
   - C. Non-Point Source:
     1. Natural None.
     2. Chemical reactions Chlorination of hydroxybenzophenone
     3. Solid waste leachate No information.
     4. Man caused non-point source No information.
5. Biodegradability (persistence): Persistent (very difficult to degrade) (category 5).
6. Effective treatment method: Activated carbon (90-100%) probable.

DATA DISPLAY

1. Chemical: chloromethyl ether
   CAS Nomenclature: 542-88-1

2. Structure:



$$ClCH_2-O-CH_2Cl$$

3. Class: halogenated ether

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry
      2. Users: Mfg irritant gases (lacrymators); chloromethylating agent; and chemical intermediate.
      3. Gross estimate of annual discharge: 500 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, or by combustion of municipal or industrial wastes.
      2. Drinking water treatment (e.g., chlorination): Possible creation during chlorination of dimethyl ether which is used as refrigerant, solvent, extraction agent, propellant for sprays, welding gases.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) fomaldehyde (gaseous) and hydrochloric acid (gaseous) can react to form chloromethyl ether. (Water) methyl ether + HOCl → chloromethyl ether + water.
      3. Solid waste leachate Compound will leach from municipal and industrial solid wastes of which it is a constituent.
      4. Man caused non-point source Use of lachrymator type irritant gases. Lab use.

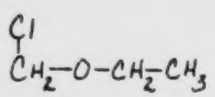
5. Biodegradability (persistence): Moderately persistent: (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: chloromethyl ethyl ether
CAS Nomenclature:

2. Structure:



$ClCH_2-O-CH_2-CH_3$

3. Class: halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 1 ton (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, or by combustion of municipal or industrial wastes.

2. Drinking water treatment (e.g., chlorination): Formed during drinking water chlorination (possibly from ethyl methyl ether which is used as a medicine).

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) possible formation by halogenation of ethers formed photochemically from radicals. (Water) ethyl methyl ether + HOCl → chloromethyl ethyl ether + wate

3. Solid waste leachate No information.

4. Man caused non-point source General use of chlorinated water; potential constituent in domestic waste waters; use as a laboratory chemical.

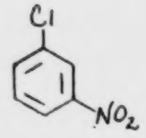
5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: m- chloronitrobenzene
CAS Nomenclature: 121-73-3

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.
2. Users: Dyestuffs mfg; chemical intermediate in organic chemicals synthesis.
3. Gross estimate of annual discharge: 100 tons (method 6).
B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Formed in small quantities during chlorination of sewage effluent, when nitrobenzene is present in effluent.
2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination, when nitrobenzene is present.
C. Non-Point Source:
1. Natural None.
2. Chemical reactions Nitrobenzene + HOCl → m-chloronitrobenzene + water.
3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
4. Man caused non-point source General laboratory use, general use of chlorinated water.

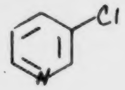
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90–100%).

DATA DISPLAY

1. Chemical: 3-chloropyridine
CAS Nomenclature: 626-60-8

2. Structure:



3. Class: heterocyclic amine

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Pesticide mfg. industry.

2. Users: Pharmaceutical mfg. (production of antihistamines); germicides, pesticides, agricultural chemicals mfg.

3. Gross estimate of annual discharge: 30 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Formed in small quantities during chlorination of sewage effluent when pyridine is present. Incineration of organic industrial wastes and municipal refuse in which material is a constituent will release small quantities.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination, when pyridine is present in the water.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Pyridine + HOCl → chloropyridine + water.

3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.

4. Man caused non-point source Agricultural runoff; general use as a germicide; general use of chlorinated water. Lab use.

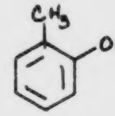
5. Biodegradability (persistence): Persistent (>18 months) (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: o-cresol
CAS Nomenclature: 95-48-7

2. Structure:



3. Class: phenol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Coal tar refining; petroleum refining; organic chemical mfg.; wood processing.

2. Users: Disinfectant; food antioxidant; perfume mfg.; dye mfg.; plastics and resins mfg.; pharmaceutical mfg.; herbicide mfg. (98% -DNOC, UCPA); tricresyl phosphate mfg.; ore flotation, textile scouring agent, organic intermediate mfg. of salicylaldehyde, coumarin; surfactant; cresylic acid constituent.

3. Gross estimate of annual discharge: 2,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Small quantities formed during sewage treatment (biological step) and biological degradation of municipal biological, and industrial wastes. Released to air during incineration of municipal refuse and industrial sludges and slurries containing o-cresol.

2. Drinking water treatment (e.g., chlorination): No evidence of formation during water purification, probably formed in small quantities.

C. Non-Point Source:

1. Natural Coal, petroleum, constituent in wood, constituent in natural runoff.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from biological wastes, municipal wastes, industrial wastes containing the material, will be formed by degradation of high molecular weight tars and polymers.

4. Man caused non-point source Automobile exhaust, roadway runoff, runoff from asphalt, general use of plastics, petroleum distillates, fuels, perfumes, oils, lubricants, metal cleaning and scouring compounds, laboratory chemical; constituents in domestic sewage.

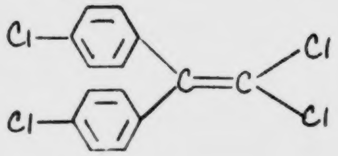
5. Biodegradability (persistence): Low persistence (~ 2 months for complete degradation) (category 3).

6. Effective treatment method: Biological treatment (95-100%); activated carbon (95-100%); incineration (>95%).

DATA DISPLAY

1. Chemical: DDE
CAS Nomenclature:

2. Structure:



3. Class: aryl alkene halogenated derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide mfg. (DDT)
      2. Users: Military product; DDT impurity; DDT uses (insecticide).
      3. Gross estimate of annual discharge: 25 tons (method 5)
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during sewage treatment or degradation of solid wastes when DDT is present. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage sludges, industrial and slurrites).
      2. Drinking water treatment (e.g., chlorination): May be fromed during drinking water purification when DDT is present.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Dehydrohalogenation of DDT to DDE
      3. Solid waste leachate Will leach from solid wastes of which DDT or DDE are constituents (minor component in most wastes due to widespread use).
      4. Man caused non-point source Agricultural runoff; degradation of DDT. Lab use.

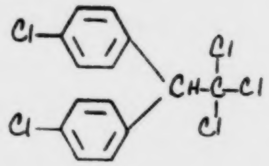
5. Biodegradability (persistence): Persistent: approximately 4 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (95 - >99%).

DATA DISPLAY

1. Chemical: DDT
   CAS Nomenclature: 50-29-3

2. Structure:



3. Class: halogenated aryl alkane derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide mfg.
      2. Users: Insecticide.
      3. Gross estimate of annual discharge: 7 tons (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage sludge, industrial sludges and slurries).
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes of which it is a constituent.
      4. Man caused non-point source Agricultural runoff. Lab use.

5. Biodegradability (persistence): Persistent: approximately 4 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (95->99%).

DATA DISPLAY

1. Chemical: decane
   CAS Nomenclature:

2. Structure: $CH_3-(CH_2)_8-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: petroleum refining.
     2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry. Constituent in polyolefin manufacturing wastes.
     3. Gross estimate of annual discharge: 300 tons (method 4).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compount to the air.
     2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   - C. Non-Point Source:
     1. Natural Constituent in paraffin fraction of petroleum.
     2. Chemical reactions None identified.
     3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which decane is a solvent.
     4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

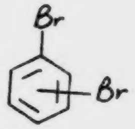
5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: dibromobenzene
CAS Nomenclature:

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Solvent (fats, waxes, resins, oils); intermediate in chemical synthesis; used in heavy liquid flotation processes (ortho-); ingredient of heat transfer media or transformer oils; constituent in motor fuels; organic synthesis of dyestuffs and drugs; manufacture of intermediates, fumigants.

3. Gross estimate of annual discharge: 200 tons (method 7).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes.
Incineration of organic industrial wastes in which dibromobenzene is a constituent will release small quantities; not released during incineration of municipal refuse.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination.

C. Non-Point Source:
1. Natural None.

2. Chemical reactions (Air) phenyl radical + bromine → dibromobenzene; (Water) benzene + HOBr → dibromobenzene + water.

3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.

4. Man caused non-point source Use as a solvent, use as a laboratory chemical, agricultural runoff, use of transformer oils, highway runoff, general use of chlorinated water.

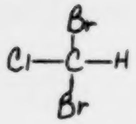
5. Biodegradability (persistence):
Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: dibromochloromethane
CAS Nomenclature:

2. Structure:



$$Cl-\underset{Br}{\overset{Br}{C}}-H$$

3. Class: non-cyclic halogenated alkane

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Mfg. fire extinguishing agents; mfg. aerosol propellants; mfg. refrigerants; mfg. pesticides; organic synthesis.

3. Gross estimate of annual discharge: 300 tons (method 3).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluents. Not formed during biological phase of sewage treatment, biological degradation of solid wastes, or incineration of municipal refuse or industrial sludges.

2. Drinking water treatment (e.g., chlorination): Results from chlorination of finished water; not formed in prior purification steps.

C. Non-Point Source:
1. Natural None

2. Chemical reactions (Air) methyl radical + bromine → dibromochloromethane; (water) methyl hydroxyl or methyl carbonyl organics + HOCl + HOBr → dibromochloromethane + water + organic acids.

3. Solid waste leachate Will leach from industrial waste sludges and slurries of which it is an ingredient.

4. Man caused non-point source Use of fire extinguishers; constituent in municipal sewage; general use of chlorinated water; use of aerosol propellants (spray cans). Lab use.

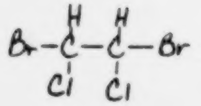
5. Biodegradability (persistence): Refractory (category 5).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: dibromodichloroethane
CAS Nomenclature:

2. Structure:



$BrCHCl{-}CHClBr$

3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Refrigeration and fire extinguishing applications.

3. Gross estimate of annual discharge: 300 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during biological phase of sewage treatment, biological degradation of solid wastes, or incineration of municipal refuse or industrial sludges and slurries.

2. Drinking water treatment (e.g., chlorination): Results from chlorination of finished water; not formed in prior purification steps.

C. Non-Point Source:

1. Natural None

2. Chemical reactions (Air) ethyl radical + bromine + chlorine → dibromodichloroethane + hydrogen bromide + hydrogen chloride. (Water) unsaturated organics + HOBr + HOCl → dibromodichloroethane + water

3. Solid waste leachate Will leach from industrial waste sludges and slurries in which compound is present.

4. Man caused non-point source Use of fire extinguishers. Lab use.

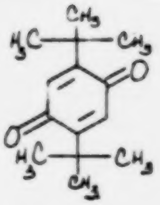
5. Biodegradability (persistence): Refractory (category 5).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: di-t-butyl-p-benzoquinone
   CAS Nomenclature:

2. Structure:



3. Class: quinone

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Oxidant, polymerization catalyst.
      3. Gross estimate of annual discharge: 50 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Probably not formed during sewage treatment or during decomposition of solid wastes. Incineration of wastes in which item is a constituent, releases small quantities.
      2. Drinking water treatment (e.g., chlorination): Not formed.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate No information.
      4. Man caused non-point source Laboratory use.

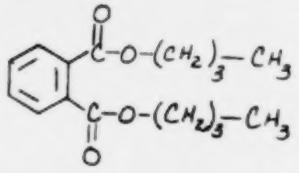
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: dibutyl phthalate
CAS Nomenclature: 84-74-2

2. Structure:



3. Class: phthalate ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Plasticizer mfg. plastics mfg recycling and processing; cosmetics; diluent in polysulfide dental impression materials; industrial stains mfg.; explosive (propellant) component used in fuel matrix of double-base rocket propellant; textile lubricating agent; used in safety glass; insecticides, printing inks, paper coatings, adhesives.

3. Gross estimate of annual discharge: 300 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents,etc. Also from lipsticks, applications of paints, coatings, and adhesives; evaporates from perfumes, inks and insecticides.

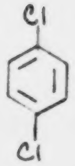
5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: 1,4-dichlorobenzene
CAS Nomenclature: 106-46-7

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry; pesticide mfg. industry.
      2. Users: Mfg. moth repellants; mfg. air deodorizers; mfg. dyes and intermediates; pharmaceuticals mfg.; soil fumigant; pesticide.
      3. Gross estimate of annual discharge: 1,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Incineration of organic industrial wastes in which dichlorobenzene is a constituent will release small quantities. Not released during incineration of municipal refuse.
      2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions (Air) phenyl radical + chlorine → 1,4-dichlorobenzene; (Water) benzene + HOCl → dichlorobenzene + water.
      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
      4. Man caused non-point source General laboratory use; agricultural runoff; use of chlorinated water.

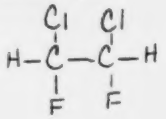
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: dichlorodifluoroethane
CAS Nomenclature:

2. Structure:



$H-\overset{Cl}{\underset{F}{C}}-\overset{Cl}{\underset{F}{C}}-H$

3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg of aerosol sprays; refrigerant; degreasing applications.

3. Gross estimate of annual discharge: 10 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during biological phase of sewage treatment, biological degradation of solid wastes, or incineration of municipal refuse or industrial sludges and slurries.

2. Drinking water treatment (e.g., chlorination): Results from chlorination and fluoridation of finished water; not formed in prior purification steps.

C. Non-Point Source:

1. Natural None

2. Chemical reactions (Air) ethyl radical + chlorine + fluorine → dichlorofluoroethane + hydrogen fluoride + hydrogen chloride. (Water) alkene + HOCl + HF → dichlorodifluoroethane + water

3. Solid waste leachate Will leach from industrial waste sludges and slurries of which it is an ingredient; will leach from municipal landfills due to disposal of spray cans.

4. Man caused non-point source Aerosol spray cans. Lab use.

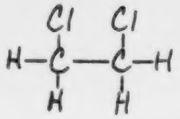
5. Biodegradability (persistence): Highly refractory to biological degradation (category 5).

6. Effective treatment method: Activated carbon (90-100%); aeration.

DATA DISPLAY

1. Chemical: 1,2-dichloroethane
CAS Nomenclature: 107-06-2

2. Structure:



$ClCH_2-CH_2Cl$

3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. of vinyl chloride; mfg of tetraethyl lead; intermediate insecticidal fumigant (Peachtree borer, Japanese beetle, root-rot nematodes); tobacco flavoring; constituent in paint, varnish and finish removers, metal degreaser, constituent in soaps and scouring compounds, wetting and penetrating agents; used in chemical synthesis and ore flotation.

3. Gross estimate of annual discharge: 80,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Possibility of production due to chlorination of sewage effluent.

2. Drinking water treatment (e.g., chlorination): Results from chlorination.

C. Non-Point Source:

1. Natural None

2. Chemical reactions (Air) ethyl radical + chlorine → 1,2-dichloroethane; (Water) alkene + HOCl → 1,2-dichloroethane + water.

3. Solid waste leachate Will be present in municipal and industrial leachate where it is a component of the disposed items.

4. Man caused non-point source Use of leaded fuels, as insecticidal fumigant, as tobacco flavoring, from applied paint, varnish and finish removers, soaps and scouring compounds, (present in domestic sewage), Lab use.

5. Biodegradability (persistence): Difficult to degrade (category 3).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: dichloroethyl ether (bis-2-chloroethyl ether)
CAS Nomenclature: 111-44-4

2. Structure:

$Cl-CH_2-CH_2-O-CH_2-CH_2-Cl$

3. Class: halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry. Constituent in waterborne waste of ethylene glycol manufacture.

2. Users: Fumigants; processing fats, waxes, greases, cellulose esters; general solvent; insecticide mfg; textile mfg (scour textiles) and cleaning; mfg. butadiene, medicinals and pharmaceuticals; selective solvent; constituent in paints, lacquers, varnishes.

3. Gross estimate of annual discharge: 500 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological degradation of sewage or solid wastes, or by combustion of municipal or industrial wastes.

2. Drinking water treatment (e.g., chlorination): Formed by chlorination of drinking water when ethyl ether is present.

C. Non-Point Source:

1. Natural None

2. Chemical reactions Can be formed from ethylene chlorhydrin in the presence of hydrogen ions. Ethyl ether HOCl → dichloroethyl ether + water.

3. Solid waste leachate Compound will leach from municipal and industrial solid wastes of which it is a constituent.

4. Man caused non-point source General use of chlorinated waters; potential constituent in domestic waste waters; use as a laboratory chemical; general use as a solvent.

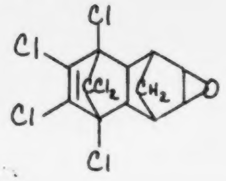
5. Biodegradability (persistence): Moderately persistent: (2-18 months)(category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: dieldrin
CAS Nomenclature: 60-57-1

2. Structure:



3. Class: cyclic halogenated alkene

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Pesticide mfg.

2. Users: Insecticide; wool processing industry.

3. Gross estimate of annual discharge: Less than 1 ton (method 5); production ceased by EPA order.

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage, sludge, industrial sludges and slurries)

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural None

2. Chemical reactions Aldrin can be epoxidized with peracids to form dieldrin.

3. Solid waste leachate Will leach from solid wastes of which it is a constituent.

4. Man caused non-point source Agricultural runoff. Lab use.

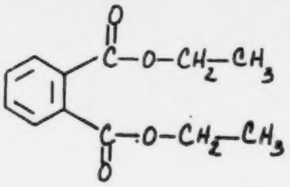
5. Biodegradability (persistence): Persistent: approximately 3 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (approx. 50%).

DATA DISPLAY

1. Chemical: diethyl phthalate
CAS Nomenclature: 84-66-1

2. Structure:



3. Class: phthalate ester

4. Sources:
  A. Industry Point Source (Water and Air)
    1. Manufacturers: Organic chemical industry.
    2. Users: Plasticizer mfg.; plastics mfg and processing; explosive (propellant) component; suitable for food packaging application (FDA); dye application agent; diluent in polysulfide dental impression materials solvent; wetting agent; camphor substitute, perfumery, alcohol denaturant, component in insecticidal sprays; mosquito repellant.
    3. Gross estimate of annual discharge: 200 tons (method 2).
  B. Treatment Point Source (Water and Air)
    1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.
    2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
  C. Non-Point Source:
    1. Natural None.
    2. Chemical reactions None identified.
    3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
    4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontanminant in lab chemicals, food, detergents,etc. Also from evaporates from perfumes, inks, insecticides, repellants, alcohols and dyes. From combustion of rocket propellants and explosives.

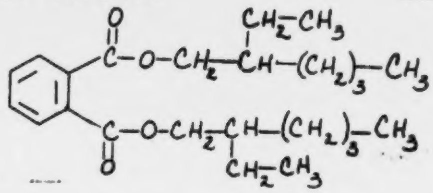
5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: di(2-ethyl hexyl) phthalate
CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Plasticizer mfg; plastics mfg and recycling, processing; organic pump fluid.

3. Gross estimate of annual discharge: 4,000 tons (method 2).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal.. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:
1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab Use, microcontaminant in lab chemicals, food, detergents, etc.

5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

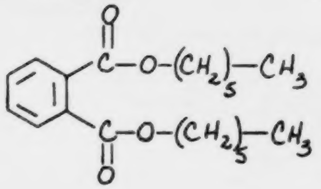
6. Effective treatment method: Activated carbon (90–100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: dihexyl phthalate

CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Plasticizer mfg, plastics mfg recycling and processing (esp. cellulose ester and vinyl plastics).

3. Gross estimate of annual discharge: 100 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics and above listed products (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

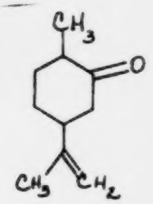
5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: dihydrocarvone
CAS Nomenclature:

2. Structure:



3. Class: ketone (cyclic alkane derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: No information.
      2. Users: No information.
      3. Gross estimate of annual discharge: 3 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): No information.
      2. Drinking water treatment (e.g., chlorination): No information.
   C. Non-Point Source:
      1. Natural No information - very similar to carvone, which occurs in dill, caraway, and spearmint oils. Possible degradant or co-metabolite of carvone.
      2. Chemical reactions None identified.
      3. Solid waste leachate No information.
      4. Man caused non-point source No information.

5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

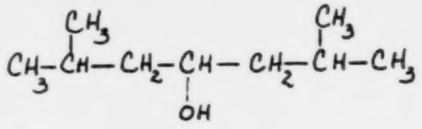
6. Effective treatment method: Biological treatment (65-85%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: di-isobutyl carbinol

CAS Nomenclature: 108-82-7

2. Structure:



$CH_3-\overset{CH_3}{\overset{|}{CH}}-CH_2-\underset{OH}{\underset{|}{CH}}-CH_2-\overset{CH_3}{\overset{|}{CH}}-CH_3$

3. Class: alcohol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Defoamer; reaction medium for production of hydrogen peroxide; surface-active agents; lubricant additives; rubber chemicals; flotation agents.

3. Gross estimate of annual discharge: 300 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): No information.

2. Drinking water treatment (e.g., chlorination): Probably not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None

2. Chemical reactions None identified

3. Solid waste leachate Will leach from solid wastes in which it is a constituent.

4. Man caused non-point source General laboratory use.

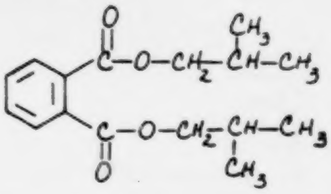
5. Biodegradability (persistence): Low persistence (~3 months to degrade) (category 2).

6. Effective treatment method: Biological treatment; activated carbon (90-100%)

DATA DISPLAY

1. Chemical: di-isobutyl phthalate
   CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry
      2. Users: Plasticizer mfg; plastics mfg. recycling and processing.
      3. Gross estimate of annual discharge: 100 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions None identified.
      3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
      4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

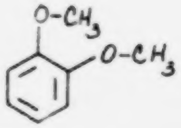
5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: 1, 2- dimethoxy benzene
CAS Nomenclature: 91-16-7

2. Structure:



3. Class: non-halogenated ether

4. Sources:
  A. Industry Point Source (Water and Air)
    1. Manufacturers: Organic chemical industry.
    2. Users: Mfg. flavors and perfumes; medicine (antiseptic - veratrole).
    3. Gross estimate of annual discharge: 30 tons (method 6).
  B. Treatment Point Source (Water and Air)
    1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes.
    2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
  C. Non-Point Source:
    1. Natural None.
    2. Chemical reactions None identified.
    3. Solid waste leachate Leaches from solid wastes in which it is a constituent.
    4. Man caused non-point source Laboratory chemical use, use as a medicinal, evaporation from perfumes.

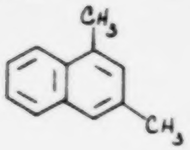
5. Biodegradability (persistence): Moderate persistency (category 3).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: 1,3-dimethyl naphthalene
CAS Nomenclature: 575-41-7

2. Structure:



3. Class: aryl alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining; coke processing.

2. Users: Impurity in naphthalene and its subsequent uses; asphalt constituent; naphtha constituent.

3. Gross estimate of annual discharge: 10 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Petroleum, coal tar.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; evaporation from moth balls.

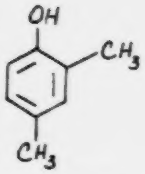
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: 2,4-dimethyl phenol
CAS Nomenclature: 105-67-7

2. Structure:



3. Class: phenol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Coal tar fractionation; coal processing.

2. Users: Intermediate in mfg. of phenolic antioxidants; pharmaceutical mfg.; plastics and resins mfg.; disinfectant (microbicide) mfg; solvent mfg; insecticides and fungicides, rubber chemicals, mfg. polyphenylene oxide, wetting agent, dyestuffs; cresylic acid constituent .

3. Gross estimate of annual discharge: 100 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Small quantities formed during sewage treatment (biological step) and biological degradation of municipal, biological, and industrial wastes. Released to air during incineration of municipal refuse and industrial sludges and slurries containing 2, 4-dimethyl phenol .

2. Drinking water treatment (e.g., chlorination): No evidence of formation during water purification, probably formed in small quantities.

C. Non-Point Source:

1. Natural Coal

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal/industrial wastes containing the material. Also formed by degradation of high molecular weight tars and polymers.

4. Man caused non-point source Asphalt and roadway runoff; general use of pharmaceuticals, fuels, plastics, pesticides; washing of dyed materials; constituent of domestic sewage.

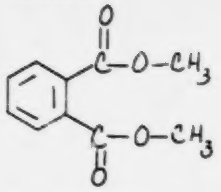
5. Biodegradability (persistence): Low persistence (~2 months for complete degradation) (category 3).

6. Effective treatment method: Biological treatment (95–100%); activated carbon (95–100%); incineration (>95%).

DATA DISPLAY

1. Chemical: dimethyl phthalate
CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Plasticizer mfg.; plastics mfg. and processing; used in fuel matrix of double-base rocket propellant; latex mfg; cellulose acetate film mfg; fluidized-bed coating in mfg. of poly(vinylidene fluoride); plasticizer in cellulose acetate and nitrocellulose, resins, rubber; constituent of lacquers, plastics, rubber, coating agents, safety glass, molding powders, insect repellants, perfumes.

3. Gross estimate of annual discharge: 100 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production, and other manufacturing processes above.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics and above listed products. (leaches from tubins, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

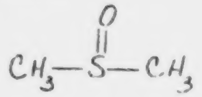
5. Biodegradability (persistence): Persistence greater than 18 mos. Compounds is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90-100%); incinceration (greater than 99%).

DATA DISPLAY

1. Chemical: dimethyl sulfoxide
CAS Nomenclature: 67-68-5

2. Structure:



$CH_3-\overset{\overset{\displaystyle O}{\|}}{S}-CH_3$

3. Class: mercaptans and other sulfur organics

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: By-product of wood pulp mfg. for paper industries; organic chemical industry.

2. Users: Solvent for acetylene, SO2, other gases; pharmaceutical mfg.; antifreeze, hydraulic fluid mfg.; paint and varnish remover; solvent for polymerization and cyanide reactions, analytical reagent, synthetic fibers mfg.; industrial cleaners mfg.; pesticide mfg.; preservation of cells at low temperatures.

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or biological decomposition of solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Dimethyl sulfide (from soil and water microorganism)
oxitation → dimethyl sulfoxide

3. Solid waste leachate Will leach from solid wastes in which item is a constituent.

4. Man caused non-point source General use as a laboratory chemical, solvent, paint and varnish remover, cleaner, pesticide, medicinal.

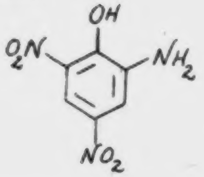
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: 4,6- dinitro- 2-amino phenol
   CAS Nomenclature: 96-91-3

2. Structure:



3. Class: phenol

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Mfg. red hair preparations; pesticides mfg.; mfg. azo dyes, indicators; reagent for albumin.
      3. Gross estimate of annual discharge: 30 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Probably not formed during sewage treatment or biological degradation of solid wastes.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which it is a constituent.
      4. Man caused non-point source General lab use, use as a colorant.

5. Biodegradability (persistence): Highly refractory and difficult to degrade (category 5).

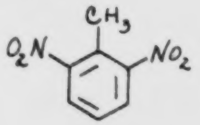
6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: 2,6 - dinitrotoluene

CAS Nomenclature: 606-20-2

2. Structure:



3. Class: nitro benzene derivative

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Explosives mfg.; organic chemical industry.

2. Users: Mfg. TNT; mfg. urethane polymers; mfg. flexible and rigid foams and surface coatings; mfg. dyes; organic synthesis.

3. Gross estimate of annual discharge: 300 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Possibly formed in small quantities by bacterial action during sewage treatment or decomposition of solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from wastes in which compound is present.

4. Man caused non-point source Combustion of explosives (minor); general lab use.

5. Biodegradability (persistence): Moderately biodegradable (3-18 months) (category 4).

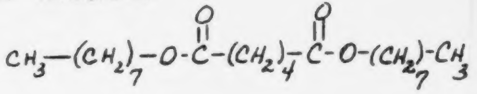
6. Effective treatment method: Activated carbon (90-100%); biological treatment systems; incineration.

DATA DISPLAY

1. Chemical: dioctyl adipate

   CAS Nomenclature:

2. Structure:



$CH_3-(CH_2)_7-O-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-O-(CH_2)_7-CH_3$

3. Class: alkyl ester

4. Sources:

   A. Industry Point Source (Water and Air)

      1. Manufacturers: Organic chemical industry.

      2. Users: Plasticizer mfg.; plastics mfg. and processing; plasticizer for cellulose-based liquid lipsticks; commonly blended with DOP and DIOP in processing polyvinyl and other polymers; solvent; aircraft cubes.

      3. Gross estimate of annual discharge: 10 tons (method 2).

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.

      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

   C. Non-Point Source:

      1. Natural None.

      2. Chemical reactions None identified.

      3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

      4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc; general use as a solvent, from aircraft lubricantion, lipsticks, application of paints and coatings.

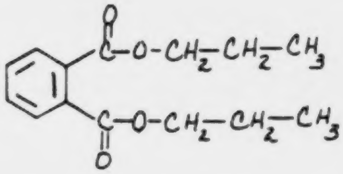
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); incinceration (greater than 99%).

DATA DISPLAY

1. Chemical: dipropyl phthalate
CAS Nomenclature:

2. Structure:



3. Class: phthalate ester

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Plasticizer mfg; plastics mfg. and processing.
      3. Gross estimate of annual discharge: 100 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
      4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

5. Biodegradability (persistence): Persistence greater than 18 mos. Compound is degraded slowly by biological organisms and is taken up and concentrated by them (category 5).

6. Effective treatment method: Activated carbon (90–100%); incinceration (greater than 99%).

DATA DISPLAY

1. Chemical: n-docosane
CAS Nomenclature: 629-97-0

2. Structure:

$CH_3-(CH_2)_{20}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining.
      2. Users: Organic synthesis; standardized hydrocarbon; mfg. paraffin products; rubber industry; paper processing industry; paraffin industry; calibration, temperature sensing device. Constituent in waterborne waste of polyolefin manufacture.
      3. Gross estimate of annual discharge: 300 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural Constituent in paraffin fraction of petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which n-docosane is a solvent.
      4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: n-dodecane
   CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_{10}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Refineries running alkylations, petroleum refining industry.
      2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; distillation chaser. Constituent in waterborne waste of polyolefin manufacture.
      3. Gross estimate of annual discharge: 600 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incinceration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural Constituent in paraffin fraction of petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which n-dodecane is a solvent.
      4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: eicosane
CAS Nomenclature: 112-95-8

2. Structure:

$CH_3-(CH_2)_{18}-CH_3$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining.

2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; cosmetics, lubricants, plasticizers. Constituent in waterborne waste of polyolefin manufacture.

3. Gross estimate of annual discharge: 300 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which eicosane is a solvent.

4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

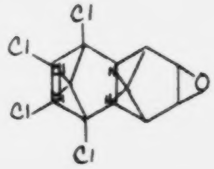
5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: endrin
   CAS Nomenclature: 72-20-8

2. Structure:



3. Class: cyclic halogenated alkene

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide Mfg.
      2. Users: Insecticide, minor constituent in dieldrin.
      3. Gross estimate of annual discharge: Less than 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage sludge, industrial sludges and slurries).
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Epoxidation of isodrin forms endrin.
      3. Solid waste leachate Will leach from solid wastes of which it is a constituent.
      4. Man caused non-point source Agricultural runoff; degradation of isodrin. Lab use.

5. Biodegradability (persistence): Persistent: approximately 3 years (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (approx. 50%).

DATA DISPLAY

1. Chemical: ethanol
CAS Nomenclature: 64-17-5

2. Structure:

CH_3-CH_2-OH

3. Class: alcohol

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Alcohol, whiskey and gin mfg.; organic chemical industry; wood products industry.
      2. Users: Mfg. acetaldehyde, acetic acid, ethylacetate, ethylchloride, ethyl ether, butadiene; ethylene dibromide; mfg. of pharmaceuticals; plastics and plasticizers mfg.; mfg. lacquers, polishes; mfg. perfumes, cosmetics; mfg. rubber; mfg. aerosols, mouthwash products; alcoholic beverages mfg.; mfg. soaps & cleaning preparations; solvent, dye mfg.; explosives mfg.
      3. Gross estimate of annual discharge: 60,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition of sewage and readily decomposes. Formed during decomposition of solid biological wastes, and is readily metabolized. Formed by decomposition of industrial sludges/slurries from above identified users, when compound is a component of those sludges/slurries, it is released to the air by surface soil spreading of same.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Fermentation of sugar, starch.
      2. Chemical reactions (Air) photo oxidation of 1-butene. (Water) 1-butene + HOCl → ethanol.
      3. Solid waste leachate Present in leachate from biological solid waste and industrial sludges/slurries where it is a reactant/unreacted product, & from solid wastes of above us
      4. Man caused non-point source Constituent in domestic wastes. Lab use. General use of drugs, medicinals, plastics, lacquers, polishes, perfumes, cosmetics, spray cans, etc.

5. Biodegradability (persistence): Readily degraded (1-2 weeks) (category 1). Water solubility and its production during decomposition of other items cause it to be virtually ever-present in water.

6. Effective treatment method: Biological treatment (95-100%).

DATA DISPLAY

1. **Chemical:** ethyl amine
   CAS Nomenclature: 75-04-7

2. **Structure:**

$CH_3{-}CH_2{-}NH_2$

3. **Class:** aliphatic amine

4. **Sources:**
   - A. Industry Point Source (Water and Air)
     - 1. Manufacturers: Organic chemical industry.
     - 2. Users: Resin mfg.; stabilizer for rubber latex; intermediate for dye mfg.; pharmaceutical mfg.; solvent in petroleum and vegetable oil refining; raw material for mfg. amides; plasticizer; detergents mfg.; organic synthesis.
     - 3. Gross estimate of annual discharge: 600 tons (method 6).
   - B. Treatment Point Source (Water and Air)
     - 1. Waste treatments/disposal (sewage and solids): Formed during biological degradation of sewage and solid wastes, but is in turn readily degraded.
     - 2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   - C. Non-Point Source:
     - 1. Natural Should occur naturally as amino acid degradant.
     - 2. Chemical reactions Ethyl radical + hydrazine → ethylamine
     - 3. Solid waste leachate Will leach from municipal wastes, wastes of biological origin, and from industrial sludges and slurries containing compound.
     - 4. Man caused non-point source General use of latex, resins; use as a laboratory chemical.

5. Biodegradability (persistence): Low persistence (1-2 months for degradation) (category 2).

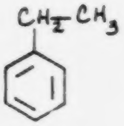
6. Effective treatment method: Biological treatment (90-95%); activated carbon.

DATA DISPLAY

1. Chemical: ethylbenzene

CAS Nomenclature: 100-41-4

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining; organic chemical industry.

2. Users: Styrene mfg.; acetophenone mfg.; solvent; asphalt constituent; naphtha constituent.

3. Gross estimate of annual discharge: 10,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Petroleum, coal.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

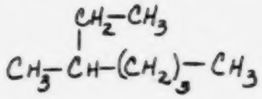
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: 2-ethyl-n-hexane
CAS Nomenclature:

2. Structure:



$CH_3-CH(CH_2-CH_3)-(CH_2)_3-CH_3$

3. Class: unsubstituted alkane

4. Sources:
  A. Industry Point Source (Water and Air)
    1. Manufacturers: Petroleum refining.
    2. Users: Solvent and thinner; paraffin industry.
    3. Gross estimate of annual discharge: 60 tons (method 3).
  B. Treatment Point Source (Water and Air)
    1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment and decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
    2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
  C. Non-Point Source:
    1. Natural Constituent in paraffin fraction of petroleum.
    2. Chemical reactions None identified.
    3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which 2-ethyl-n-hexane is a solvent.
    4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3).

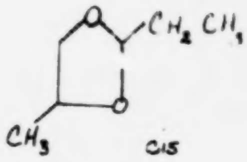
6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: Cis-2-ethyl-4-methyl-1,3-dioxolane

CAS Nomenclature:

2. Structure:



3. Class: non-halogenated ether

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: Constituent in waste of fiberglass and textile manufacturing industry.

3. Gross estimate of annual discharge: 3 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate May leach from wastes containing fiberglass.

4. Man caused non-point source Fiberglass use.

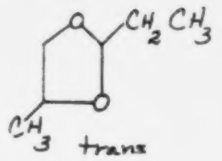
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: trans-2-ethyl-4-methyl-1,3-dioxolane
CAS Nomenclature:

2. Structure:



3. Class: non-halogenated ether

4. Sources:
  A. Industry Point Source (Water and Air)
    1. Manufacturers: None identified.
    2. Users: Constituent in waste of fiberglass and textile manufacturing industry.
    3. Gross estimate of annual discharge: 3 tons (method 6).
  B. Treatment Point Source (Water and Air)
    1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes.
    2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
  C. Non-Point Source:
    1. Natural None.
    2. Chemical reactions None identified.
    3. Solid waste leachate May leach from wastes containing fiberglass.
    4. Man caused non-point source Fiberglass use.

5. Biodegradability (persistence): Very difficult to degrade (category 4).

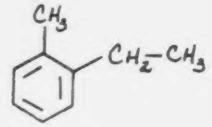
6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: o - ethyl toluene

   CAS Nomenclature:

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:

   A. Industry Point Source (Water and Air)

   1. Manufacturers: Organic chemical industry; petroleum refining industry.

   2. Users: Mfg. dyes, medicinals, flavors, perfumes, sweeteners, germicides; asphalt and naphtha constituent.

   3. Gross estimate of annual discharge: 60 tons (method 6).

   B. Treatment Point Source (Water and Air)

   1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.

   2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

   C. Non-Point Source:

   1. Natural Petroleum.

   2. Chemical reactions None identified.

   3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

   4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; solvent use; perfume evaporation.

5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

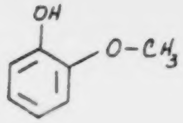
6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: guaiacol

CAS Nomenclature: 90-05-1

2. Structure:



3. Class: phenol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; wood processing industry.

2. Users: Mfg. perfumes and flavors (vanillin); raw material for mfg. of papaverine (medicinal); mfg. catechol and guaiacol compounds.

3. Gross estimate of annual discharge: 10 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by waste treatment.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural Wood; coal tar; major constituent of beechwood and creosote.

2. Chemical reactions None identified.

3. Solid waste leachate Disposal of wood or coal tars and their decomposition would leach guaiacol, municipal wastes or industrial wastes, sludges or slurries where compound is present.

4. Man caused non-point source Use of perfumes, flavors (vanillin), medicinals.

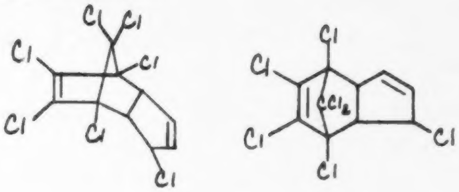
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Biological treatment; activated carbon.

DATA DISPLAY

1. Chemical: heptachlor
CAS Nomenclature: 76-44-8

2. Structure:



3. Class: cyclic halogenated alkene

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide Mfg.
      2. Users: Insecticide.
      3. Gross estimate of annual discharge: Less than 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes. Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage, sludge, industrial sludges and slurries).
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes of which it is a constituent.
      4. Man caused non-point source Agricultural runoff. Lab use.

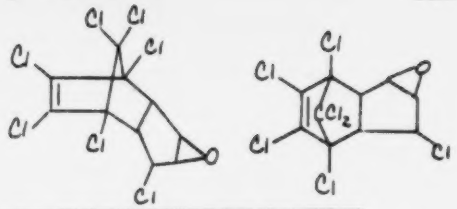
5. Biodegradability (persistence): Persistent: approximately 3 years to degrade (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (approx. 50%).

DATA DISPLAY

1. **Chemical:** heptachlor epoxide
   CAS Nomenclature: 1024-57-3

2. **Structure:**



3. **Class:** cyclic halogenated alkene

4. **Sources:**
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide mfg.
      2. Users: Insecticide; also minor impurity in heptachlor.
      3. Gross estimate of annual discharge: Less than 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or degradation of solid wastes Released to air when wastes containing material are incinerated (e.g., municipal refuse, sewage, sludge, industrial sludges and slurries).
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Heptachlor or chlordane can be epoxidized to form heptachlor epoxide.
      3. Solid waste leachate Will leach from solid wastes of which it is a constituent.
      4. Man caused non-point source Agricultural runoff. Lab use.

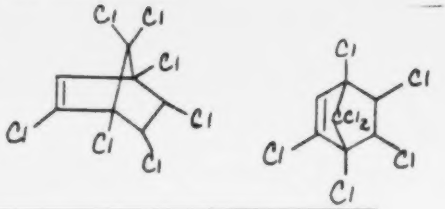
5. Biodegradability (persistence): Persistent: approximately 3 years (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration inefficient for residual concentrations (approx. 50%).

DATA DISPLAY

1. **Chemical:** 1,2,3,4,5,7,7-heptachloronorbornene
CAS Nomenclature:

2. **Structure:**



3. **Class:** cyclic halogenated alkene

4. **Sources:**
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Not manufactured directly. It is a bicyclochlorinated pesticide manufacturing by-product.
      2. Users: Insecticide (as by-product).
      3. Gross estimate of annual discharge: Less than 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Possibly formed during oxidative phase of sewage treatment and biological degradation of solid wastes, assuming chlorinated bicyclo pesticides degrade to heptachloronorbornene.
      2. Drinking water treatment (e.g., chlorination): Possibly formed during drinking treatment by oxidation of chlorinated bicyclo pesticides.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Heptachlor undergoes ring cleavage and rearrangement to heptachloronorbornene
      3. Solid waste leachate Possible leachate from chlorinated bicyclo pesticide containing wastes.
      4. Man caused non-point source Agricultural runoff; pesticide degradation.

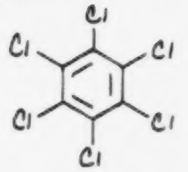
5. Biodegradability (persistence): Similar to lindane (>1 yr.) (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: hexachlorobenzene
CAS Nomenclature: 118-74-1

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry; by-product of tetrachloroethylene mfg.
      2. Users: Mfg. pentachlorophenol; mfg. wood preservative; fungicide, seed treatment (control of wheat bunt); used in production of aromatic fluorocarbons.
      3. Gross estimate of annual discharge: 1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Generally not formed during sewage treatment or decomposition of solid wastes.
      2. Drinking water treatment (e.g., chlorination): Generally not formed during chlorination.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions Phenyl radical + chlorine → hexachlorobenzene.
      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
      4. Man caused non-point source General laboratory use; agricultural runoff.

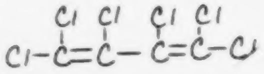
5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90–100%).

DATA DISPLAY

1. Chemical: hexachloro-1, 3-butadiene
   CAS Nomenclature: 87-68-3

2. Structure:



$$Cl-\overset{Cl}{C}=\overset{Cl}{C}-\overset{Cl}{C}=\overset{Cl}{C}-Cl$$

3. Class: non-cyclic halogenated alkene

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Solvent for natural rubber, synthetic rubber and other polymers; heat transfer liquid, transformer liquid, and hydraulic fluid; washing liquor for removing hydrocarbons.
      3. Gross estimate of annual discharge: 2 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed by biological decomposition of sewage or solid wastes, or by incineration. Released to air by inefficient solvent recovery/recirculation due to its volatility.
      2. Drinking water treatment (e.g., chlorination): May be formed during chlorination process.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions
         1,3-butadiene + $HOCl$ → hexachloro-1,3-butadiene.
      3. Solid waste leachate Will leach from municipal or industrial wastes in which this compound is present.
      4. Man caused non-point source Roadway runoff (hydraulic fluids and rubber); general use of chlorinated water. Lab use.

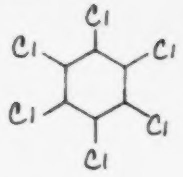
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** hexachlorocyclohexane (lindane)
CAS Nomenclature: 58-87-9

2. **Structure:**



3. Class: cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Pesticide mfg.
      2. Users: Medicinal mfg. (scabicide); insecticide mfg.
      3. Gross estimate of annual discharge: <1 ton (method 5).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological waste disposal.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions Hexyl radical + chlorine → hexachlorocyclohexane.
      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
      4. Man caused non-point source Agricultural runoff. Lab use.

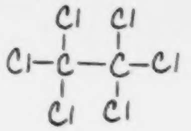
5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: hexachloroethane
CAS Nomenclature: 67-72-1

2. Structure:



3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. smoke candles and grenades; by-product of industrial chlorination processes; plasticizer for cellulose esters; minor use in rubber and insecticidal formulations; medicinal mfg.; moth repellant; retardant in fermentation processes; fire extinguishing fluids mfg.; camphor substitute in nitro cellulose solvent.

3. Gross estimate of annual discharge: 2,000 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Produced in very small quantities from chlorination of sewage effluent prior to discharge. Not formed during biological decomposition of sewage or solid waste or by incineration. Released to air due to its volatility and inefficient solvent recovery/recirculation.

2. Drinking water treatment (e.g., chlorination): Produced in very small quantities by chlorination.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) ethyl radical + chlorine → hexachloroethane; (Water) alkene + HOCl → hexachloroethane + water.

3. Solid waste leachate Will leach from municipal or industrial wastes in which this compound is present.

4. Man caused non-point source General use in veterinary medicine, fire extinguishers, moth repellants, insecticides, and as a laboratory chemical. General use of chlorinated water.

5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** hexadecane
CAS Nomenclature: 544-76-3

2. **Structure:**

$CH_3-(CH_2)_{14}-CH_3$

3. **Class:** unsubstituted alkane

4. **Sources:**
A. Industry Point Source (Water and Air)
1. Manufacturers: petroleum refining.

2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; reference for diesel fuels; solvent; organic intermediate. constituent in waterborne waste of polyolefin manufacture.

3. Gross estimate of annual discharge: 500 tons (method 3).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:
1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which hexadecane is a solvent.

4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

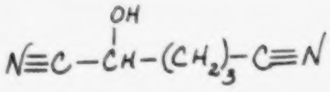
5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: 2-hydroxyadiponitrile
   CAS Nomenclature:

2. Structure:



$N\equiv C-\overset{OH}{CH}-(CH_2)_3-C\equiv N$

3. Class: nitrile

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: None identified.
      2. Users: None identified.
      3. Gross estimate of annual discharge: 3 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): No information.
      2. Drinking water treatment (e.g., chlorination): No information.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate No information.
      4. Man caused non-point source General laboratory use.

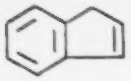
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: indene
CAS Nomenclature: 95-13-6

2. Structure:



3. Class: unsubstituted aromatic

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Petroleum refining; coke processing.

2. Users: Paint and coating mfg.; tile mfg.; preparation of coumarone-indene resins; chemical synthesis intermediate; asphalt and naphtha constituent.

3. Gross estimate of annual discharge: 100 tons (method 3).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes, and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:
1. Natural Coal, lignite, crude petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

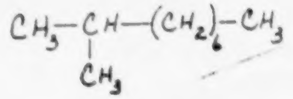
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: Isodecane
CAS Nomenclature:

2. Structure:



$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-(CH_2)_6-CH_3$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining.

2. Users: Organic synthesis; solvent; mfg. paraffin products; rubber industry; paper processing industry. Constituent in waterborne waste of polyolefin manufacture.

3. Gross estimate of annual discharge: 300 tons (method 4).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which isodecane is a solvent.

4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

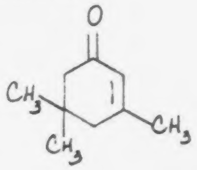
5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: isophorone
   CAS Nomenclature:

2. Structure:



3. Class: ketone (cyclic alkane derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Solvent (hi boiling); organic chemicals mfg. (intermediate for alcohols, raw material for 3,5-dimethylaniline); solvent for polyvinyl and nitrocellulose resins; lacquers, finishes mfg; pesticide mfg.
      3. Gross estimate of annual discharge: 300 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None identified.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present.
      4. Man caused non-point source General use as a solvent, laboratory chemical, pesticide. Application of certain lacquers and finishes.

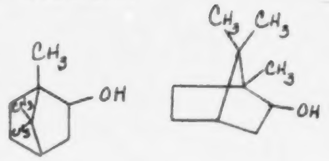
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: isoborneol (exo-2-camphanol)
CAS Nomenclature: 124-76-5

2. Structure:



3. Class: alcohol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; wood processing industry.

2. Users: Pine-scented odorant; raw material for synthetic mfg. of camphor; perfume mfg.

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Expected to be formed in small quantities by sewage treatment/solid waste decomposition.

2. Drinking water treatment (e.g., chlorination): Not formed by drinking water treatment.

C. Non-Point Source:

1. Natural Major component of pine oil (1.6%); forest runoff component.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal waste, biological wastes (such as trees), & sludges/slurries where compound is unrecovered reactant in above industries.

4. Man caused non-point source Use of perfumes, household soaps/detergents. Lab use.

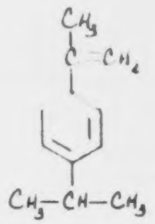
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Biological treatment; activated carbon.

DATA DISPLAY

1. Chemical: 1-isopropenyl-4-isopropyl benzene
   CAS Nomenclature:

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining.
      2. Users: None identified.
      3. Gross estimate of annual discharge: 3 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
      4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

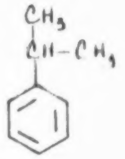
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: isopropyl benzene (cumene)
   CAS Nomenclature: 98-82-8

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining, coal tar distillation, organic chemical industry.
      2. Users: Mfg. of acetone, alpha-methylstyrene, and phenol; mfg. polymerization catalysts; component motor fuel; mfg. diisopropyl benzene; catalyst for acrylic and polyester-type resins; solvent asphalt and naphtha constituent.
      3. Gross estimate of annual discharge: 7,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Petroleum crudes, coal tar.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
      4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; combustion of motor fuel.

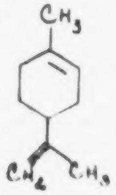
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: limonene (dipentene)
CAS Nomenclature:

2. Structure:



3. Class: unsubstituted alkene

4. Sources:
   - A. Industry Point Source (Water and Air)
     - 1. Manufacturers: Wood turpentine fractionation, extraction of natural materials; by-product of synthetic camphor mfg.
     - 2. Users: Production monoterpenes; solvent resin mfg.; perfume/flavor mfg.; additive in sulfurized lube oil; rubber compounding and reclaiming; dispersing agent in paints and coatings mfg.; waxes and polishes mfg.; solvent for ester gum, metallic soap dryers, etc.; dispersing agent for pigments and drugs.
     - 3. Gross estimate of annual discharge: 200 tons (method 3).
   - B. Treatment Point Source (Water and Air)
     - 1. Waste treatments/disposal (sewage and solids): Not formed during waste treatment/disposal.
     - 2. Drinking water treatment (e.g., chlorination): Not formed by drinking water treatment.
   - C. Non-Point Source:
     - 1. Natural Pine stumps (southwest); oil cells in orange skin; constituent in: lemon, bergemot, caraway, peppermint, spearmint and other oils.
     - 2. Chemical reactions None identified.
     - 3. Solid waste leachate Leaches from municipal waste, biological waste (such as trees), sludges/slurries where compound is an unrecovered reactant in above industries.
     - 4. Man caused non-point source General use of soaps, paints, perfumes, floor & furniture waxes and polishes.

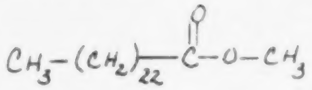
5. Biodegradability (persistence): Difficult to degrade (category 3).

6. Effective treatment method: Biological treatment; activated carbon.

DATA DISPLAY

1. Chemical: methyl ester of lignoceric acid
CAS Nomenclature:

2. Structure:



$CH_3-(CH_2)_{22}-\overset{\overset{O}{\|}}{C}-O-CH_3$

3. Class: alkyl ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; natural products industry.

2. Users: Intermediate in special synthesis; medical research; reference standard in gas chromatography.

3. Gross estimate of annual discharge: 30 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not expected to be produced during biological decomposition of sewage/solid wastes.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Beechwood tar; rottenoak wood.

2. Chemical reactions None identified

3. Solid waste leachate Will leach in small quantities from decomposing biological wastes.

4. Man caused non-point source General laboratory use.

5. Biodegradability (persistence): Moderately persistent. Approx. 3-6 months to completely degrade (category 3).

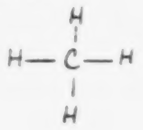
6. Effective treatment method: Biological (90%).

DATA DISPLAY

1. Chemical: methane

CAS Nomenclature: 74-82-8

2. Structure:



$$CH_4$$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Natural gas mfg.; coal processing.

2. Users: Mfg. carbon black, acetylene, hydrogen, halogenated methanes and ethylene, nethanol, hydrogen cyanide, carbon tetrachloride, chloroform, fuel.

3. Gross estimate of annual discharge: 3000 tons (method 4).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition of sewage and solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed by chlorination.

C. Non-Point Source:

1. Natural Marsh gas; natural gas; coal.

2. Chemical reactions Methyl radical + ethyl aldehyde radical → methane + ethyl aldehyde.

3. Solid waste leachate Will be present in leachate from domestic wastes and industrial wastes of which it is a constituent.

4. Man caused non-point source Pipeline and domestic leakage; tobacco smoke. Lab use.

5. Biodegradability (persistence): Difficult to degrade (category 3).

6. Effective treatment method: Biological treatment (70-90%).

DATA DISPLAY

1. Chemical: methanol
CAS Nomenclature:

2. Structure: CH_3-OH

3. Class: alcohol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; wood processing industry.

2. Users: Mfg. formaldehyde, methacrylates, methylamines, dimethyl terephthalate, methyl halides, ethylene glycol; mfg. antifreeze, polyformaldehydes; solvent; mfg. plastics; industrial solvent (pharmaceuticals, polymers, etc.), aviation fuel (for water injection); denaturant for ethanol; dehydrator for natural gas.

3. Gross estimate of annual discharge: 100,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition of sewage and readily decomposes. Formed during decomposition of solid biological wastes and is readily metabolized. Formed by decomposition of industrial sludges/slurries from above identified users; when compound is a component of those sludges/slurries, it is released to the air by surface soil spreading of same.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Wood.

2. Chemical reactions Methyl radical + oxygen → methyl peroxide radical → methanol + formaldehyde.

3. Solid waste leachate Present in leachate from biological solid waste and industrial sludges/slurries where it is a reactant/unreacted product, & from solid wastes of above users

4. Man caused non-point source Constituent of domestic waste. General use of plastics, antifreeze. General laboratory use.

5. Biodegradability (persistence): Low persistence (1-2 months) (category 2). Water solubility and its production during decomposition of other items cause it to be virtually ever-present in water.

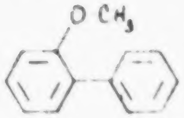
6. Effective treatment method: Biological treatment (75-85%).

DATA DISPLAY

1. **Chemical:** 2-methoxy biphenyl

   CAS Nomenclature: 86-26-0

2. **Structure:**



3. Class: non-halogenated ether

4. Sources:

   A. Industry Point Source (Water and Air)

      1. Manufacturers: None identified.

      2. Users: None identified.

      3. Gross estimate of annual discharge: 1 ton or less (method 6).

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): May be formed from benzyl phenol during pH adjustment following chlorination.

      2. Drinking water treatment (e.g., chlorination): May be formed from benzyl phenol during pH adjustment following chlorination.

   C. Non-Point Source:

      1. Natural None.

      2. Chemical reactions benzyl phenol + chloromethane or bromomethane + alkaline conditions → methoxybiphenyl

      3. Solid waste leachate Will leach from solid wastes where this compound is present.

      4. Man caused non-point source None identified.

5. Biodegradability (persistence): Moderately persistent (category 4).

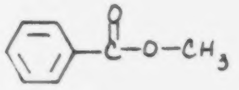
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl benzoate

CAS Nomenclature:

2. Structure:



3. Class: Aryl ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; natural products industry.

2. Users: Dye carrier in dyeing of polyester fibers; additives for disinfectants, soy sauce, and pesticides; perfume mfg.; solvent for cellulose esters and ethers, resins and rubber; flavoring.

3. Gross estimate of annual discharge: 30 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not expected to be produced during biological decomposition of sewage/solid wastes. Incineration of municipal wastes, and industrial waste sludges and slurries in which methyl benzoate is a constituent will release small quantities to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Occurs in oils of clove, ylang ylang, and tuberose.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach in small quantities from decomposing biological wastes.

4. Man caused non-point source Water-borne discharges of food and domestic sewage. General use of dyes, disinfectants, pesticides, perfurmes, flavorings. Lab use.

5. Biodegradability (persistence): Biodegraded without much difficulty (category 2).

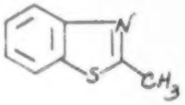
6. Effective treatment method: Biological (90%).

DATA DISPLAY

1. Chemical: methyl benzothiazole

CAS Nomenclature: 120-75-2

2. Structure:



3. Class: benzothiazole

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 30 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes. Incineration of petroleum products, tars, etc., and combustion of fuels may release small quantities.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural Minor constituent in coal and petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes where this compound is present.

4. Man caused non-point source Fuel combustion. Lab use.

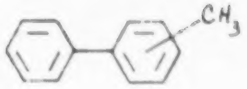
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl biphenyl
   CAS Nomenclature: 643-58-3

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: None identified.
      2. Users: None identified.
      3. Gross estimate of annual discharge: 10 tons or less (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or biological degradation of solid wastes. May be released during combustion of various wastes.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from wastes where compound is present.
      4. Man caused non-point source Lab use.

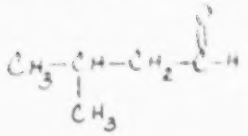
5. Biodegradability (persistence): Moderately persistent (category 4).

6. Effective treatment method: Activated carbon (90–100%).

DATA DISPLAY

1. Chemical: 3-methyl butanal
CAS Nomenclature:

2. **Structure:**



$CH_3-CH(CH_3)-CH_2-C(=O)-H$

3. Class: aldehyde (alkane derivative)

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Organic chemical industry; petroleum refining industry.
     2. Users: Flavor/perfume mfg.; pharmaceuticals; synthetic resins; rubber accelerators.
     3. Gross estimate of annual discharge: 30 tons (method 6).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): May be formed in small quantities during sewage treatment or biological degradation of solid wastes.
     2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   - C. Non-Point Source:
     1. Natural Oils in lemon, orange, peppermint, eucalyptus
     2. Chemical reactions 3-methyl butene or 3-methyl butanol + oxidation conditions (HOCl) → methyl butanal.
     3. Solid waste leachate Will leach from wastes in which this compound is present; may also leach in small quantities from biological wastes.
     4. Man caused non-point source Evaporation from perfume, lab use.

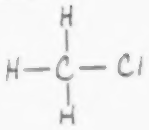
5. Biodegradability (persistence): Low biodegradability (1-2 months for degradation) (category 2).

6. Effective treatment method: Biological treatment methods (85-95%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl chloride
CAS Nomenclature: 74-87-3

2. Structure:



$$\mathrm{H}-\overset{\mathrm{H}}{\underset{\mathrm{H}}{\mathrm{C}}}-\mathrm{Cl}$$

3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. silicones, tetraethyl lead, synthetic rubber and methyl cellulose; refrigerant mfg.; mfg. of organic chemicals (methylene chloride, chloroform, CCl_4, etc.); mfg. fumigants; low temperature solvent; catalyst carrier in polymerization; medicine; fluid for thermometric or thermostatic equipment; methylating agent; extractant; propellant; herbicide.

3. Gross estimate of annual discharge: 5,000 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Formed during chlorination of sewage effluent prior to discharge. Not formed by biological decomposition of sewage or solid wastes, or by incineration. Released to air by inefficient solvent recovery/recirculation.

2. Drinking water treatment (e.g., chlorination): Formed during chlorination process.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) methyl radical + chlorine → Methyl chloride + chlorine radical; (Water) carbonyl or hydroxyl organics + HOCl → methyl chloride + water.

3. Solid waste leachate Will leach from municipal or industrial wastes in which this compound is present.

4. Man caused non-point source General use of leaded fuels, medicines, herbicides; use as a laboratory chemical. General use of chlorinated water.

5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

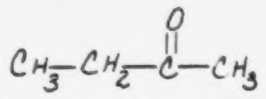
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl ethyl ketone (butanone)

CAS Nomenclature:

2. Structure:



$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

3. Class: ketone (alkane derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Solvent or swelling agent for resins; intermediate in mfg. of ketones and amines; flush-off paint stripper; extraction and production of wax from lube oil fractions of petroleum; solvent in nitrocellulose coatings and vinyl films; cements and adhesives; smokeless powder mfg.; cleaning fluids; printing (catalyst & carrier).

3. Gross estimate of annual discharge: 8,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): During biological treatment of complex organics, MEK is a minor intermediate which is quickly degraded in efficient systems. Surface spreading of sludges and slurries containing MEK releases quantities to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural None

2. Chemical reactions 1-butene or 2-butanol + oxidation condition (HOCl) → methyl ketone.

3. Solid waste leachate Present in landfill sludges where used as process solvent or unrecovered reactant. Can be degraded during soil migration.

4. Man caused non-point source General use as a solvent (> 80% loss to water and air), evaporation from applied paints and coatings, cements, adhesives, cleaning fluids. Lab use.

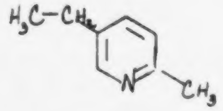
5. Biodegradability (persistence): Low persistence (approximately 2 months for complete degradation) (category 1).

6. Effective treatment method: Biological treatment (~90%); activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** 2-methyl-5-ethyl pyridine
CAS Nomenclature: 104-90-5

2. **Structure:**



3. **Class:** heterocyclic amine

4. **Sources:**
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry
      2. Users: Mfg. nicotinic acid and nicotinamide; mfg. of vinyl pyridines for copolymers; intermediate for germicides and textile finishes; corrosion inhibitor for chlorinated solvents.
      3. Gross estimate of annual discharge: 30 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): None identified.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from wastes in which this compound is present.
      4. Man caused non-point source Use as a laboratory chemical.

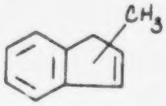
5. **Biodegradability (persistence):** Very difficult to degrade (category 3).

6. **Effective treatment method:** Biological treatment methods; activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methylindene
   CAS Nomenclature: 2177-47-1

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining industry.
      2. Users: Minor ingredient in lower grade indene and its subsequent uses; asphalt and naphtha constituent.
      3. Gross estimate of annual discharge: 30 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
      4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

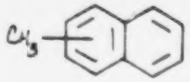
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl naphthalene
   CAS Nomenclature: 91-57-6

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining; coal processing.
      2. Users: Insecticide mfg.; mfg. phthalic anhydride; solvent organic synthesis; asphalt and naphtha constituent.
      3. Gross estimate of annual discharge: 600 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid waste. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Coal, petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
      4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; use of certain insecticides.

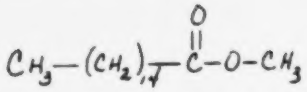
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: methyl palmitate
   CAS Nomenclature:

2. Structure:



$$CH_3-(CH_2)_{14}-\overset{\overset{\displaystyle O}{\|}}{C}-O-CH_3$$

3. Class: alkyl ester

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Intermediate in detergents, emulsifiers, wetting agents, stabilizers resins, lubricants, plasticizers. Constituent in animal feed; used in medical research.
      3. Gross estimate of annual discharge: 30 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Compounds not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
      4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, lubricant. Will leach from biological wastes when bodies contain minor amounts of methyl palmitate.

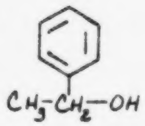
5. Biodegradability (persistence): Moderately persistant in sewage and soils (2-18 months for complete degradation) (category 3).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: methyl phenyl carbinol (1-phenyl ethanol)
CAS Nomenclature: 95-85-1

2. Structure:



3. Class: alcohol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Perfume and flavoring mfg.; dye mfg.; laboratory reagent.

3. Gross estimate of annual discharge: 20 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition o sewage and readily decomposes. Formed during decomposition of solid biological wastes readily metabolized. Formed by decomposition of industrial sludges/slurries, from above identified users. When compound is a component of those sludges/slurries, it is released to the air by surface soil spreading of these sludges/slurries.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural No information.

2. Chemical reactions Hydroxylation of vinyl benzene.

3. Solid waste leachate Present in leachate from biological solid waste (minor) and industrial sludges/slurries where it is a reactant/unreacted product, and from solid wastes above users.

4. Man caused non-point source
General use of perfumes, flavors, dyes; general laboratory use.

5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

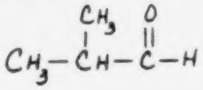
6. Effective treatment method: Biological treatment (95-100%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: 2-methyl propanal

CAS Nomenclature:

2. Structure:



$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{C}H-\overset{\overset{\displaystyle O}{\|}}{C}-H$$

3. Class: aldehyde (alkane derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Solvent (artificial leather mfg. coated paper, textile mfg. plastics, oil, drug and perfume mfg. industries); mfg. of brake fluid, butyl esters, plasticizers; mfg. resins and rubber chemicals; mfg. organic chemicals

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Formed in small quantities during sewage treatment and biological degradation of solid wastes.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during drinking water treatment.

C. Non-Point Source:

1. Natural None identified.

2. Chemical reactions Isobutylene or isobutanol + air or water oxidation conditions → 2-methyl propanol.

3. Solid waste leachate Will leach from biological wastes, municipal wastes (in small quantities) and from appropriate industrial sludge & slurries.

4. Man caused non-point source Use as a solvent, general use as a laboratory chemical.

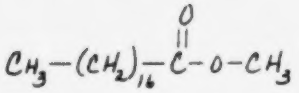
5. Biodegradability (persistence): Biodegradable (category 2).

6. Effective treatment method: Biological treatment (85-95%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: methyl stearate
CAS Nomenclature: 112-61-8

2. Structure:



$CH_3-(CH_2)_{16}-\overset{\overset{O}{\parallel}}{C}-O-CH_3$

3. Class: alkyl ester

4. Sources:
   - A. Industry Point Source (Water and Air)
     - 1. Manufacturers: Organic chemical industry; natural products industry.
     - 2. Users: Lubricants, polishes, creams (lipstick, rouge) mfg; intermediate for stearic acid detergents, emulsifiers, wetting agents, stabilizers, resins, plasticizers and textiles; biochemical and medical research.
     - 3. Gross estimate of annual discharge: 70 tons (method 6).
   - B. Treatment Point Source (Water and Air)
     - 1. Waste treatments/disposal (sewage and solids): Very small amounts may be formed during biological treatment of sewage or biological degradation of sewage sludge, released to air during incineration of municipal waste, general industrial rubbish, and waste sludges and slurries from uses described above.
     - 2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   - C. Non-Point Source:
     - 1. Natural None.
     - 2. Chemical reactions None identified.
     - 3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics, detergents, emulsifiers and lubricants.
     - 4. Man caused non-point source General use of plastics (leaches from tubings, dishes, paper, containers, etc.) cosmetics, polishes, lubricants. Lab use.

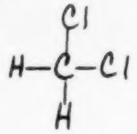
5. Biodegradability (persistence): Difficult to biodegrade (category 3).

6. Effective treatment method: Activated carbon (>90%); biological treatment(~70%).

DATA DISPLAY

1. Chemical: methylene chloride
   CAS Nomenclature: 75-09-2

2. Structure:



$$\mathrm{H-\underset{\underset{H}{|}}{\overset{\overset{Cl}{|}}{C}}-Cl}$$

3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: None identified.
      2. Users: Paint stripping and solvent degreasing; mfg. aerosols; mfg. photographic film; mfg. of synthetic fibers; extraction of naturally-occurring heat sensitive substances; refrigerant in low-pressure refrig. and air-conditioners; fumigant; solvent; textile and leather coatings; pharmaceutical; used in plastics processing; spotting agent; dewaxing; organic synthesis; blowing agent in foams.
      3. Gross estimate of annual discharge: 10,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Possibility of formation due to chlorination of sewage effluent prior to discharge.
      2. Drinking water treatment (e.g., chlorination): Results from chlorination.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions (Air) methyl radical + chlorine → methylene chloride. (Water) methyl carbonyl or methyl hydroxyl organics + HOCl → methylene chloride + water
      3. Solid waste leachate Will occur in industrial and municipal landfill where it is a component of the disposed items.
      4. Man caused non-point source Use of paint strippers and degreasing compounds; lab use; spray cans; use as a fumigant; use of pharmaceuticals; foams that employ it as blowing agent.

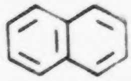
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: naphthalene
   CAS Nomenclature: 91-20-3

2. Structure:



3. Class: unsubstituted aromatic

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining; coal tar distillation.
      2. Users: Moth ball mfg.; mfg. a and b naphthols and pesticides, fungicides; mfg. dyes; detergents and wetting agents mfg.; mfg. phthalic anhydride; mfg. synthetic resins, celluloids, lampblack, smokeless powder; solvents, lubricants, motor fuel mfg.; cutting fluid, synthetic tanning, preservative, emulsion breaker, asphalt and naphtha constituent.
      3. Gross estimate of annual discharge: 6,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid waste. Incineration of organic petroleum or coal wastes and combustion of fuels will release this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   C. Non-Point Source:
      1. Natural Petroleum, coal tar.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
      4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; evaporation from moth balls, use as a fungicide, combustion and utilization of lubricants and motor fuels, use of cutting fuels.

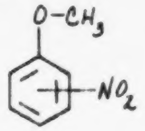
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: nitroanisole
   CAS Nomenclature: 100-17-4

2. Structure:



3. Class: nitro compound (aromatic derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Dye mfg.; synthesis of guaiacol; organic synthesis; mfg. of pharmaceutical intermediates.
      3. Gross estimate of annual discharge: 60 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): None identified.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from solid wastes in which this compound is present.
      4. Man caused non-point source Use as a laboratory chemical.

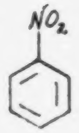
5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: nitrobenzene
CAS Nomenclature: 98-95-3

2. Structure:



3. Class: nitro compound (benzene derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. aniline and dyestuffs; solvent recovery plants; mfg. rubber chemicals, drugs, photographic chemicals; refining lubricant oils; solvent in TNT production; solvent for cellulose others; cellulose acetate mfg.; constituent in metal polish and shoe polish formulations.

3. Gross estimate of annual discharge: 10,000 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): No information.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from wastes in which compound is present.

4. Man caused non-point source Use of shoe polish and metal polish; solvent usage; use as a laboratory chemical.

5. Biodegradability (persistence): Very difficult to degrade (category 4).

6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: nonane
   CAS Nomenclature:

2. Structure:

$CH_3—(CH_2)_7—CH_3$

3. Class: unsubstituted alkane

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Petroleum refinery.
     2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; biodegradable detergents, distillation chaser. Constituent in waterborne waste of polyolefin manufacture.
     3. Gross estimate of annual discharge: 300 tons (method 4).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
     2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   - C. Non-Point Source:
     1. Natural Constituent in paraffin fraction of petroleum.
     2. Chemical reactions None identified.
     3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which nonane is a solvent.
     4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: octadecane
   CAS Nomenclature: 593-45-3

2. Structure:

$CH_3-(CH_2)_{16}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Petroleum refining.
     2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; calibration. Constituent in waterborne waste of polyolefin manufacture.
     3. Gross estimate of annual discharge: 300 tons (method 3).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
     2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   - C. Non-Point Source:
     1. Natural Constituent in paraffin fraction of petroleum.
     2. Chemical reactions None identified.
     3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which octadecane is a solvent.
     4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: octane
CAS Nomenclature: 111-65-9

2. Structure:

$CH_3-(CH_2)_6-CH_3$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining.

2. Users: Solvent recovery plants; organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; calibrations; azeotropic distillations. Constituent in waterborne waste of polyolefin manufacture.

3. Gross estimate of annual discharge: 300 tons (method 4).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which octane is a solvent.

4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoof, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: octylchloride
CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_7-Cl$

3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Chemical intermediate; mfg. of organic metallics compounds.
      3. Gross estimate of annual discharge: 50 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during biological decomposition of sewage or solid wastes, or during incineration.
      2. Drinking water treatment (e.g., chlorination): Formed during chlorination process.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions (Air) octyl radical + chlorine → octyl chloride + chlorine radical; (Wat
octene + HOCl → octyl chloride + water.
      3. Solid waste leachate Will leach from industrial wastes in which this compound is present.
      4. Man caused non-point source General laboratory use. General use of chlorinated water.

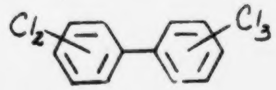
5. Biodegradability (persistence): Low persistence (2-6 months) (category 3).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: pentachlorobiphenyl
CAS Nomenclature:

2. Structure:



3. Class: halogenated biphenyl (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Mfg. electrical insulation; fire resistant heat transfer and hydraulic fluids; high temperature lubricants; elastomers; adhesives, paints, lacquers, varnishes, pigments, and waxes; heat sensitive paper.
      3. Gross estimate of annual discharge: 500 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Potentially formed in small quantities during chlorination of sewage containing biphenyl. Not formed during biological decomposition of sewage or municipal wastes. Incineration of municipal and industrial wastes releases PCBs.
      2. Drinking water treatment (e.g., chlorination): Potentially formed in small quantities during chlorination of drinking water.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Biphenyl + HOCl → PCB
      3. Solid waste leachate Compound leaches from municipal wastes and industrial wastes containing PCBs.
      4. Man caused non-point source General use of PCB containing materials, e.g., paints, coatings, adhesives, paper, electrical insulation, etc. Lab use.

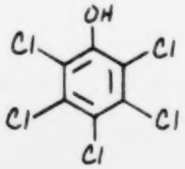
5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: pentachlorophenol
CAS Nomenclature: 87-86-5

2. Structure:



3. Class: phenol

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry; pesticide mfg. industry.

2. Users: Mfg. insecticides, algicides, herbicides, and fungicides; preservation of wood and wood products; mfg. of sodium pentachlorophenate.

3. Gross estimate of annual discharge: Less than 1 ton (method 5).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during biological treatment of sewage or by decomposition of sewage sludge.
Will be released during incineration of wastes of which compoun is a constituent (both municipal, industrial and sewage sludge).

2. Drinking water treatment (e.g., chlorination): Generally not formed during chlorine disinfection, instead of complete chlorination, oxidation and ring cleavage predominate after formation of 2, 4, 6-trichlorophenol.

C. Non-Point Source:

1. Natural None

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from wastes in which it is a constituent.

4. Man caused non-point source Agricultural runoff; general use of treated wood. Lab use

5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: pentadecane
   CAS Nomenclature: 109-66-0

2. Structure:
   $CH_3-(CH_2)_{13}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining.
      2. Users: Mfg. paraffin products; rubber mfg; paper processing industry. Constituent in waterborne waste of polyolefin manufacture.
      3. Gross estimate of annual discharge: 600 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural Constituents in paraffin fraction of petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which pentadecane is a solvent.
      4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2).

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: pentane

CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_3-CH_3$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining; natural gas recovery.

2. Users: Specialty chemical mfg; solvent recovery and extraction; natural gas processing plants; blowing agent for plastic foams; production of olefin, hydrogen, ammonia; Fuel production, artificial ice mfg.; low temperature thermometers, pesticide.

3. Gross estimate of annual discharge: 300 tons (method 4).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air. Very small quantities of pentane may be released to the air as a result of petroleum waste operations (e.g., flares, etc.) due to the volatility of pentane.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified

3. Solid waste leachate Will leach in very small quantities from municipal/industrial solid wastes/sludges/slurries.

4. Man caused non-point source Leakage of natural gas-carrying pipelines; leakage due to domestic use. Component in municipal waste where pentane is a constituent of domestic products; combustion of petroleum/natural gas fuels will release very small quantities of pentane to the air. Lab use.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 3)

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (99%).

DATA DISPLAY

1. Chemical: pentanol
CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_4-OH$

3. Class: alcohol

4. Sources:
  A. Industry Point Source (Water and Air)
    1. Manufacturers: Petroleum industry.
    2. Users: Solvent; mfg. of petroleum additives; urea-formaldehyde plastics processing; organic chemicals mfg.; raw material for pharmaceutical preparations.
    3. Gross estimate of annual discharge: 10,000 tons (method 7).
  B. Treatment Point Source (Water and Air)
    1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition of sewage and readily decomposes. Formed during decomposition of solid biological wastes and is readily metabolized. Formed by decomposition of industrial sludges/slurries from above identified users. When compound is a component of those sludges/slurries, it is released to the air by surface soil spreading of same.
    2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
  C. Non-Point Source:
    1. Natural None identified.
    2. Chemical reactions Pentyl radical + oxygen → Pentyl peroxide radical, pentyl peroxide radical + hydroxyl radical → pentanol + oxygen; hydroxylation of pentene.
    3. Solid waste leachate Present in leachate from biological solid waste and industrial sludges/slurries where it is present and from solid wastes of above users.
    4. Man caused non-point source General use of pharmaceuticals, petroleum, and certain plastics, general laboratory use.

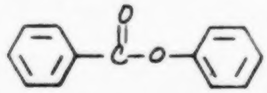
5. Biodegradability (persistence): Readily degraded (1-2 weeks) (category 1).

6. Effective treatment method: Biological treatment (95-100%)

DATA DISPLAY

1. Chemical: phenyl benzoate
   CAS Nomenclature: 93-99-2

2. Structure:



3. Class: aryl ester

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Plasticizer mfg; plastics mfg and processing; mfg. perfume, insecticides, antiseptics.
      3. Gross estimate of annual discharge: 30 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and waste sludges and slurries from plastic production and other manufacturing processes above.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions None identified.
      3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.
      4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc; general use of perfumes, insecticides, antiseptics.

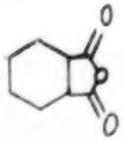
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%)

DATA DISPLAY

1. Chemical: phthalic anhydride
CAS Nomenclature: 85-44-9

2. Structure:



3. Class: aryl ester

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Plants oxidizing xylenes, naphthalene.

2. Users: Plasticizer mfg; specialty chemical mfg; mfg. alkydand polyester resins; mfg. synthetic fibers; mfg. of dyes, pigments, pharmaceuticals, insecticides, chlorinated products.

3. Gross estimate of annual discharge: 5,000 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during sewage treatment/solid waste disposal. Released to air during incineration of municipal refuse, general industrial rubbish, and water sludges and slurries from plastic production and other manufacturing processes above.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics and above listed products. (leaches from tubings, dishes, paper, containers, etc.) Lab use, microcontaminant in lab chemicals, food, detergents, etc.

5. Biodegradability (persistence): Difficult to degrade (category 3).

6. Effective treatment method: Activated carbon (90-100%); incineration (greater than 99%).

DATA DISPLAY

1. Chemical: propanol
   CAS Nomenclature:

2. Structure:

$CH_3-CH_2-CH_2-OH$

3. Class: alcohol

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Plants oxidizing propane and fusel oil.
      2. Users: Solvent in mfg. printing inks, nail polishes, polymerization and spinning of acrylonitrile, dyeing of wool, cellulose acetate film, PVC adhesives; metal degreaser; mfg. floor wax, cleaning preparations, solvent for resins, cellulose esters, waxes, vegetable oils; brake fluid mfg.; antiseptic mfg.
      3. Gross estimate of annual discharge: 6,000 tons (method 2).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Formed during biological decomposition of sewage and readily decomposes. Formed during decomposition of solid biological wa & is readily metabolized. Formed by decomposition of industrial sludges/slurries from above identified users. When the compound is a component of those sludges/slurries, it released to the air by surface soil spreading of those sludges/slurries.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.
   C. Non-Point Source:
      1. Natural Fermentation and spoilage products of many vegetable substances.
      2. Chemical reactions (Air) propyl radical + osygen → propyl peroxide radical propyl radical + hydroxyl radical → propanol + oxygen; (water) hydroxylation of propylene
      3. Solid waste leachate Present in leachate from biological solid waste and industrial sludges/slurries where it is a reactant/unreacted product and from solid wastes of above
      4. Man caused non-point source Constituent of domestic waste, evaporation from nail polish, floor wax, general laboratory use.

5. Biodegradability (persistence): Readily biodegraded (2 weeks) (category 1).

6. Effective treatment method: Biological treatment (90–100%).

DATA DISPLAY

1. **Chemical:** propylamine
CAS Nomenclature: 107-10-8

2. **Structure:**

$CH_3-CH_2-CH_2\ NH$

3. **Class:** aliphatic amine

4. **Sources:**
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Mfg. rubber chemicals, dyestuffs, pharmaceuticals, agricultural chemicals, corrosion inhibitors, textile and leather finishing resins.

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Potentially formed during sewage treatment and biological decomposition of solid wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

C. Non-Point Source:
1. Natural Should occur naturdlly as bioorganic degradant; general runoff.

2. Chemical reactions Propyl radical + hydrazine → propyl amine

3. Solid waste leachate Present in leachate from solid wastes with biological materials as constituent and from wastes where compound is present.

4. Man caused non-point source Laboratory use.

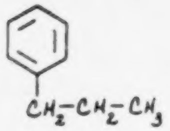
5. Biodegradability (persistence): Biodegradable (category 2).

6. Effective treatment method: Biological treatment (85-95%); activated carbon (90-100%).

DATA DISPLAY

1. Chemical: propylbenzene
   CAS Nomenclature: 103-65-1

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Petroleum refining; by-product of cumene mfg.
     2. Users: Mfg. methyl styrene; textile dyeing, printing solvent for cellulose acetate, asphalt and naphtha constituent.
     3. Gross estimate of annual discharge: 2,000 tons (method 7).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic, petroleum or coal wastes, and combustion of fuels will release this compound to the air.
     2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.
   - C. Non-Point Source:
     1. Natural Petroleum.
     2. Chemical reactions None identified.
     3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.
     4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent.

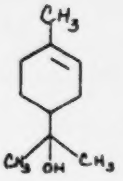
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: l-terpineol
   CAS Nomenclature:

2. Structure:



3. Class: alcohol

4. Sources:

   A. Industry Point Source (Water and Air)

      1. Manufacturers: Extraction of essential oils, fractional distillation of pine oils, wood processing industry.

      2. Users: Perfume mfg.; soap mfg.; hydrocarbon solvent; solvent for resins, cellulose esters and ethers; disinfectants; antioxidants; medicines; flavorings constituent.

      3. Gross estimate of annual discharge: 100 tons (method 3).

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): Expected to be formed during sewage treatment/solid waste decomposition in small quantities.

      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water treatment.

   C. Non-Point Source:

      1. Natural Several essential oils; pine oil component; forest runoff.

      2. Chemical reactions None identified.

      3. Solid waste leachate Leaches from municipal waste, biological waste (such as trees) sludges/slurries where compound is unrecovered reactant in above industries.

      4. Man caused non-point source General use of soaps, perfumes, disinfectants, medicines, flavorings.

5. Biodegradability (persistence): Difficult to degrade (category 3).

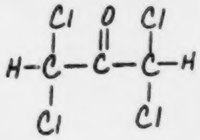
6. Effective treatment method: Biological; activated carbon.

DATA DISPLAY

1. Chemical: 1,1,3,3-tetrachloroacetone

CAS Nomenclature: 632-21-3

2. Structure:



3. Class: halogenated ketone

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 1 ton (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Produced in very small quantities during chlorination of sewage effluent prior to discharge. Not produced by biological decomposition of sewage or solid wastes, or by incineration.

2. Drinking water treatment (e.g., chlorination): Produced in very small quantities by chlorination process.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions Acetone + HOCl → 1,1,3,3,-tetrachloroacetone + hydrogen chloride.

3. Solid waste leachate Will leach from landfill sewage containing chlorinated water, if present.

4. Man caused non-point source General laboratory use. General use of chlorinated water.

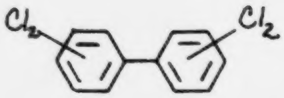
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: tetrachlorobiphenyl
CAS Nomenclature:

2. Structure:



3. Class: halogenated biphenyl (benzene derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. electrical insulation; fire resistant heat transfer and hydraulic fluids; high temperature lubricants; elastomers; adhesives; paints, lacquers, varnishes, pigments and waxes; heat sensitive paper.

3. Gross estimate of annual discharge: 500 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Potentially formed in small quantities during chlorination of sewage containing biphenyl. Not formed during biological decomposition of sewage or municipal wastes. Incineration of municipal and industrial wastes releases PCBs.

2. Drinking water treatment (e.g., chlorination): Potentially formed in small quantities during chlorination of drinking water.

C. Non-Point Source:

1. Natural None

2. Chemical reactions Biphenyl + HOCl → PCB

3. Solid waste leachate Compound leaches from municipal wastes and industrial wastes containing PCBs.

4. Man caused non-point source General use of PCB containing materials, e.g., paints, coatings, adhesives, paper, electrical insulation, etc.

5. Biodegradability (persistence): Persistent (>18 months) (category 5).

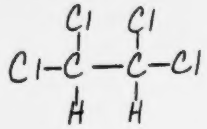
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: tetrachloroethane

CAS Nomenclature:

2. Structure:



3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. 1,1-dichloroethylene; solvent for chlorinated rubber and other organic materials; insecticide mfg.; bleach mfg.; paint, varnish, rust remover mfg.; soil fumigant; cleansing and degreasing metals; photo films, resins and waxes; extractant of oils and fats; organic synthesis, herbicide; alcohol denaturant.

3. Gross estimate of annual discharge: 2,000 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological decomposit of sewage or solid wastes, or by incineration. Released to air due to its volatility and inefficient solvent recovery/recirculation.

2. Drinking water treatment (e.g., chlorination): Potentially formed during chlorination of treated water.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) ethyl radital + chlorine → tetrachloroethane + chlorine radica
(Water) unsaturated alkane + HOCl → tetrachloroethane + water.

3. Solid waste leachate Will leach from municipal or industrial wastes in which this compound is present.

4. Man caused non-point source General use of denatured alcohol, herbicides, chlorinated rubber. General use as laboratory chemical, and of chlorinated water.

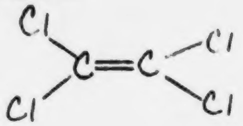
5. Biodegradability (persistence): Refractory (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** tetrachloroethylene
CAS Nomenclature: 127-18-4

2. **Structure:**



3. Class: non-cyclic halogenated alkene

4. Sources:
A. Industry Point Source (Water and Air)
1. Manufacturers: Organic chemical industry.

2. Users: Dry cleaning operations; metal degreasing; solvents for fats, greases, waxes, rubber, gums; caffeine from coffee; remove soot from industrial boilers; mfg. paint removers, printing inks; mfg. trichloroacetic acid; vermifuge; heat transfer medium; mfg. of fluorocarbons.

3. Gross estimate of annual discharge: 2,000 tons (method 2).

B. Treatment Point Source (Water and Air)
1. Waste treatments/disposal (sewage and solids): Not formed by biological decomposition of sewage or solid wastes, or by incineration. Released to air due to its volatility and inefficient solvent recovery/recirculation.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities by the chlorination process.

C. Non-Point Source:
1. Natural None.

2. Chemical reactions (Air) ethylene + chlorine radical → tetrachloroethylene; (water) unsaturated organics + HOCl → tetrachloroethylene + water.

3. Solid waste leachate None identified.

4. Man caused non-point source General consumption of decaffeinated coffee. General use of dry cleaning solvents, spray cans. General laboratory use. General use of chlorinated water.

5. Biodegradability (persistence):
Moderately persistent (2-18 months) (category 4).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: tetradecane
   CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_{12}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   - A. Industry Point Source (Water and Air)
     1. Manufacturers: Petroleum refining.
     2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel reserach; mfg. paraffin products; rubber industry; paper processing industry; distillation chaser. Constituent in waterborne waste of polyolefin manufacture.
     3. Gross estimate of annual discharge: 800 tons (method 3).
   - B. Treatment Point Source (Water and Air)
     1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
     2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   - C. Non-Point Source:
     1. Natural Constituent in paraffin fraction of petroleum.
     2. Chemical reactions None identified.
     3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which tetradecane is a solvent.
     4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

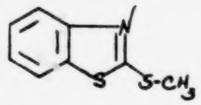
5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2).

6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: thiomethylbenzothiazole
CAS Nomenclature:

2. Structure:



3. Class: benzothiazole

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: None identified.

2. Users: None identified.

3. Gross estimate of annual discharge: 5 tons (method 7).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): No information.

2. Drinking water treatment (e.g., chlorination): No information.

C. Non-Point Source:

1. Natural No information.

2. Chemical reactions None identified.

3. Solid waste leachate No information.

4. Man caused non-point source No information.

5. Biodegradability (persistence): Very refractory to biodegradation (category 5).

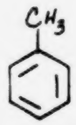
6. Effective treatment method: Activated carbon.

DATA DISPLAY

1. Chemical: toluene

CAS Nomenclature: 108-88-3

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining, coal tar distillation.

2. Users: Mfg. benzene derivatives, caprolactam, saccharin, medicines, dyes, perfumes; specialty chemical mfg.; solvent recovery plants; mfg. TNT; organic chemical mfg.; component gasoline; solvent for paints and coatings, gums, resins, most oils, rubber, and vinyl organosols; diluent and thinner in nitrocellulose lacquers, adhesive solvent in plastic toys and model airplanes; detergent mfg.; asphalt naphtha constituent.

3. Gross estimate of annual discharge: 10,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic, petroleum or coal wastes, and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Coal tar, petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; combustion of gasoline; model hobbies.

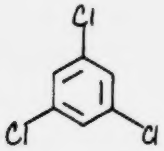
5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: trichlorobenzene
   CAS Nomenclature: 120-82-1

2. Structure:



3. Class: halogenated benzene derivative

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry; pesticide mfg.
      2. Users: Solvent for high melting products; coolant in electrical installations and glass tempering; mfg. 2,5-dichlorophenol; polyester dyeing; termite preparations; synthetic transformer oil; lubricants; heat transfer medium, insecticides.
      3. Gross estimate of annual discharge: 500 tons (method 7).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes.
         Incineration of organic wastes in which trichlorobenzene is a constituent will release small quantities. Not released during incineration of municipal refuse.
      2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions (Air) phenyl radical + chlorine → trichlorobenzene; (Water) benzene + HOCl → trichlorobenzene + water.
      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component.
      4. Man caused non-point source General laboratory use; agricultural runoff; termite control operations; use of transformer oil; general use of chlorinated water.

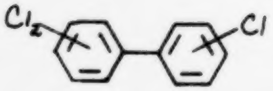
5. Biodegradability (persistence): Persistent (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: trichlorobiphenyl
CAS Nomenclature:

2. Structure:



3. Class: halogenated biphenyl (benzene derivative)

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Mfg. electrical insulation; fire resistant heat transfer and hydraulic fluids; high temperature lubricants; elastomers; adhesives; paints, lacquers, varnishes, pigments and waxes; heat sensitive paper.
      3. Gross estimate of annual discharge: 500 tons (method 6).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Potentially formed in small quantities during chlorination of sewage containing biphenyl. Not formed during biological decomposition of sewage or municipal wastes. Incineration of municipal and industrial wastes releases PCBs.
      2. Drinking water treatment (e.g., chlorination): Potentially formed in small quantities during chlorination of drinking water containing biphenyl.
   C. Non-Point Source:
      1. Natural None
      2. Chemical reactions Biphenyl + HOCl → PCB
      3. Solid waste leachate Compound leaches from municipal wastes and industrial wastes containing PCBs.
      4. Man caused non-point source General use of PCB containing materials, e.g., paints, coatings, adhesives, paper, electrical insulation, etc.

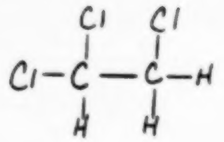
5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: 1,1,2-trichloroethane
   CAS Nomenclature: 79-00-5

2. Structure:



3. Class: non-cyclic halogenated alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Organic chemical industry.
      2. Users: Mfg. 1,1-dichloroethylene; solvent for chlorinated rubber and various organic materials (fats, oils, resins, etc.); organic synthesis.
      3. Gross estimate of annual discharge: 2,000 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not produced by biological decomposition of sewage or solid wastes, or by incineration. Released to air due to its volatility and inefficient solvent recovery/recirculation
      2. Drinking water treatment (e.g., chlorination): Formed in small quantity by chlorination process.
   C. Non-Point Source:
      1. Natural None.
      2. Chemical reactions (Air) ethyl radical + chlorine → 1,1,2-trichloroethane; (Water) unsaturated alkane + HOCl → 1,1,2-trichloroethane + water.
      3. Solid waste leachate Will leach from municipal and industrial wastes, if present.
      4. Man caused non-point source General use of chlorinated rubber, chlorinated water. General laboratory use.

5. Biodegradability (persistence): Refractory (category 5).

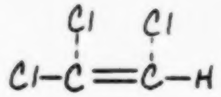
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: 1,1,2-trichloroethylene

CAS Nomenclature:

2. Structure:



$$Cl-\overset{Cl}{C}=\overset{Cl}{C}-H$$

3. Class: non-cyclic halogenated alkene

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Dry cleaning operations and metal degreasing; solvents for fats, greases, waxes; solvents for greases and waxes from cotton, wool, etc., and caffeine from coffee; mfg. organic chemicals; solvent for cellulose esters and ethers; solvent for dyeing; refrigerant and heat exchange liquid; organic synthesis; fumigant; anesthetic.

3. Gross estimate of annual discharge: 10,000 tons (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during biological decomposition of sewage or solid wastes, or by incineration. Discharged to air due to volatility and inefficient solvent recovery/recirculation.

2. Drinking water treatment (e.g., chlorination): Formed during chlorination process.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) Ethylene + chlorine → 1,1,2 trichloroethylene; (Water) unsaturated alkanes + HOCl → 1,1,2-trichloroethylene.

3. Solid waste leachate Will leach from municipal or industrial wastes in which this compound is present.

4. Man caused non-point source General use of dry cleaning solvents and other compounds containing the chemical. General laboratory use. General use of chlorinated water.

5. Biodegradability (persistence): Moderately persistent (2-18 months) (category 4).

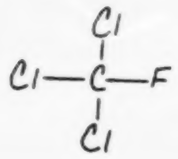
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. Chemical: trichlorofluoromethane

CAS Nomenclature:

2. Structure:



$$Cl-\overset{Cl}{\underset{Cl}{C}}-F$$

3. Class: non-cyclic halogenated alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. aerosol sprays; mfg. commercial refrigeration equipment; blowing agent for polyurethane foams; cleaning compounds mfg.; solvent; fire extinguisher; chemical intermediate.

3. Gross estimate of annual discharge: 1 ton (method 2).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed by biological decomposition of sewage or solid wastes, or by incineration. Released to air by inefficient solvent recovery/recirculation due to its volatility.

2. Drinking water treatment (e.g., chlorination): Formed in small quantities during chlorination and fluoridation.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions (Air) methyl radical + chlorine → trichloromethyl radical; trichloromethyl radical + fluorine → trichlorofluoromethane; (Water) methyl carbonyl + methyl hydroxyl organic + HOCl → trichloromethane; trichloromethane + HF → trichlorofluoromethane.

3. Solid waste leachate Will leach from municipal/industrial wastes in which this compound is present.

4. Man caused non-point source General use of spray cans, polyurethane foams, cleaning compounds/solvents, fire extinguishers. General use of chlorinated water. Lab use.

5. Biodegradability (persistence): Persistent (category 5).

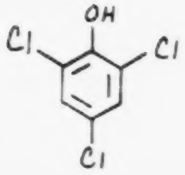
6. Effective treatment method: Activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** 2,4,6-trichlorophenol

   CAS Nomenclature: 88-06-2

2. **Structure:**



3. **Class:** phenol

4. **Sources:**

   A. Industry Point Source (Water and Air)

      1. Manufacturers: Organic chemical industry; pesticide mfg.

      2. Users: Mfg. antiseptics, bactericides, fungicides, germicides; mfg. wood and glue preservatives; used as anti-mildew agent for textiles.

      3. Gross estimate of annual discharge: 8 tons (method 5).

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): Not produced during biological sewage treatment or decomposition of solid wastes. Formed in small quantities during chlorinatio of sewage effluent. Incineration of organic industrial wastes in which compound is a constituent releases small quantities; released from incineration of municipal refuse.

      2. Drinking water treatment (e.g., chlorination): Readily formed during chlorination activities.

   C. Non-Point Source:

      1. Natural None

      2. Chemical reactions (Water) phenol + $HOCl \rightarrow$ 2,4,6-trichlorophenol

      3. Solid waste leachate Will leach from industrial sludges/slurries of which it is a component. Also will leach from municipal solid wastes.

      4. Man caused non-point source Agricultural runoff; general use as fungicide, germicide, etc.; general use as laboratory chemical; general use of chlorinated water.

5. Biodegradability (persistence): Persistent (>18 months) (category 5).

6. Effective treatment method: Activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: n-tridecane
CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_{11}-CH_3$

3. Class: unsubstituted alkane

4. Sources:
   A. Industry Point Source (Water and Air)
      1. Manufacturers: Petroleum refining.
      2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; distillation chaser. Constituent in waterborne waste of polyolefin manufacture.
      3. Gross estimate of annual discharge: 800 tons (method 3).
   B. Treatment Point Source (Water and Air)
      1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constituents releases this compound to the air.
      2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.
   C. Non-Point Source:
      1. Natural Constituents in paraffin fraction of petroleum.
      2. Chemical reactions None identified.
      3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which n-tridecane is a solvent.
      4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2).

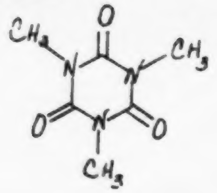
6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. Chemical: trimethyl-trioxo-hexahydro-triazine isomer

   CAS Nomenclature:

2. Structure:



3. Class: heterocyclic amine

4. Sources:

   A. Industry Point Source (Water and Air)

      1. Manufacturers: None identified.

      2. Users: None identified.

      3. Gross estimate of annual discharge: 1 ton or less (method 6)

   B. Treatment Point Source (Water and Air)

      1. Waste treatments/disposal (sewage and solids): Possibly formed during biological phase of sewage treatment and biological degradation of solid wastes, when triazine compounds are constituent.

      2. Drinking water treatment (e.g., chlorination): No information.

   C. Non-Point Source:

      1. Natural None

      2. Chemical reactions Possible oxidation product of triazine herbicides.

      3. Solid waste leachate May leach from wastes containing triazine compounds or derivatives.

      4. Man caused non-point source Agricultural runoff.

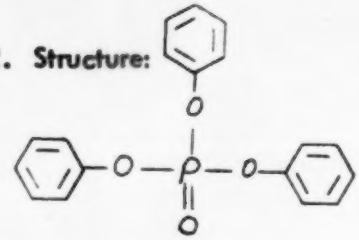
5. Biodegradability (persistence): Moderately persistent (approximately 1 year to degrade) (category 4).

6. Effective treatment method: Most probable: activated carbon (90-100%).

DATA DISPLAY

1. **Chemical:** triphenyl phosphate
CAS Nomenclature:

2. **Structure:**



3. Class: phosphate ester

4. Sources:

A. Industry Point Source (Water and Air)

1. **Manufacturers:** Organic chemical industry.

2. **Users:** Mfg. plasticizers; gasoline additives; insecticides; flotation agents, stabilizers, anti-oxidants and surfactants; substitute for camphor (non-combustible); fire retardant.

3. Gross estimate of annual discharge: 600 tons (method 6).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Compound not formed during biological decomposition of sewage or solid wastes. Small quantities released to air during incineration of municipal refuse and industrial wastes.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. **Natural** None.

2. Chemical reactions None identified.

3. Solid waste leachate Leaches from municipal and industrial wastes containing plastics.

4. Man caused non-point source General use of plastics, surfactants, insecticides. Component of gasoline engine exhaust. Lab use.

5. Biodegradability (persistence): Persistent; highly refractory to biodegradation. (Category 5).

6. Effective treatment method: No information.

DATA DISPLAY

1. Chemical: n-undecane
CAS Nomenclature:

2. Structure:

$CH_3-(CH_2)_9-CH_3$

3. Class: unsubstituted alkane

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum refining.

2. Users: Organic synthesis; solvent; standardized hydrocarbon; jet fuel research; mfg. paraffin products; rubber industry; paper processing industry; petroleum research; distillation chaser. Constituent in waterborne waste of polyolefin manufacture.

3. Gross estimate of annual discharge: 500 tons (method 3).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not formed during sewage treatment or decomposition of solid wastes. Incineration of municipal waste and industrial sludges and slurries containing petroleum constitutents releases this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not formed during drinking water purification.

C. Non-Point Source:

1. Natural Constituent in paraffin fraction of petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from general municipal and industrial solid wastes; and will leach from solid sludges and slurries of petroleum refining industry and paraffin utilizing industries, and wastes in which n-undecane is a solvent.

4. Man caused non-point source Component in municipal waste and wastewater from general use of paraffins. Also laboratory use, highway runoff, automobile exhaust, motorboat exhaust, and from general use of petroleum oils, tars, etc.

5. Biodegradability (persistence): Low persistence (1-2 months for complete degradation) (category 2).

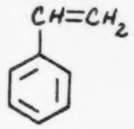
6. Effective treatment method: Biological treatment (80-95%); activated carbon (90-100%); incineration (>99%).

DATA DISPLAY

1. **Chemical:** Vinyl benzene

CAS Nomenclature: 100-42-5

2. **Structure:**



3. **Class:** aryl alkane (benzene derivative)

4. **Sources:**

A. Industry Point Source (Water and Air)

1. Manufacturers: Organic chemical industry.

2. Users: Mfg. styrene, polystyrene; mfg. synthetic rubber; ABS plastics mfg ; mfg. resins, insulators; mfg. protective coatings (styrene-butadiene latex, alkyds); chemical intermediate.

3. Gross estimate of annual discharge: 20,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic,petroleum, or coal wastes, and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural None.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General use of rubber, plastics, resins. Lab use.

5. **Biodegradability (persistence):** Difficult to degrade biologically (category 3).

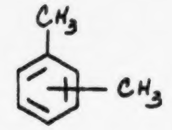
6. **Effective treatment method:** Activated carbon (90-100%); biological treatment (90-100%).

DATA DISPLAY

1. Chemical: xylene

CAS Nomenclature: 95-47-6

2. Structure:



3. Class: aryl alkane (benzene derivative)

4. Sources:

A. Industry Point Source (Water and Air)

1. Manufacturers: Petroleum distillation, coal tar distillation, coal gas distillation, organic chemical industry.

2. Users: Mfg. phthalic acid and anhydride; mfg. terephthalic acid for polyester; solvent recovery plants; specialty chemical manufacture; mfg. isophthalic acid, aviation gasoline, protective coatings mfg.; solvent for alkyd resins, lacquers, enamels, rubber cements; dye mfg. intermediate; insecticide mfg.; pharmaceutical mfg.; asphalt and naphtha constituent.

3. Gross estimate of annual discharge: 150,000 tons (method 1).

B. Treatment Point Source (Water and Air)

1. Waste treatments/disposal (sewage and solids): Not produced during sewage treatment or degradation of solid wastes. Incineration of organic, petroleum, or coal wastes, and combustion of fuels will release this compound to the air.

2. Drinking water treatment (e.g., chlorination): Not produced during drinking water treatment.

C. Non-Point Source:

1. Natural Coal tar, petroleum.

2. Chemical reactions None identified.

3. Solid waste leachate Will leach from solid wastes in which compound is present as a constituent.

4. Man caused non-point source General uses of asphalt and naphtha; general laboratory use; use as a solvent; engine exhaust.

5. Biodegradability (persistence): Difficult to degrade biologically (category 3).

6. Effective treatment method: Activated carbon (90-100%); biological treatment (90-100%).

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
acenaphthylene (1)			x	x								189, 203
acetaldehyde (2)	x	x					x	x	x	x		188, 209[a]
acetic acid (3)					x							111
acetone (4)	x	x					x	x	x	x	Pittsburgh PA, unspecified cities in NW Georgia, Bronson MI	188, 193, 177, 192, 198, 207, 176, 208, 209
acetophenone (5)	x											177
acetylene dichloride (6)	x	x					x			x		176, 177, 204, 209
aldrin (7)						x[a]					Carville LA[a], Vicksburg MS[a], Cape Girardeau MO[a], Omaha NB[a], St. Louis MO[a], Burlington IA[a], Jefferson City MO[a], several unspecified cities,	201[a], 8
atrazine (8)	x					x					Cedar Rapids IA, Marshalltown IA, Oskaloosa IA, Waterloo IA, Davenport IA, Iowa City IA, Des Moines IA	188, 195, 104
de ethyl atrazine (9)	x											188
barbital (10)		x										33, 198, 204
behenic acid, methyl ester (11)		x										198
benzene (12)	x	x			x		x		x	x	Philadelphia (tentative), Pittsburgh PA	190, 192, 193, 177, 108, 111, 176, 209
benzene sulfonic acid (13)		x										198, 204
benzoic acid (14)									x			209
benzopyrene (15)											unspecified city	8
benzothiazole (16)											Philadelphia PA (tentative)	190
benzothiophene (17)				x								189

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
benzyl butyl phthalate (18)	×	×										188, 198, 33, 204
borneol (19)	×											176, 177
bromobenzene (20)	×											193, 177, 176
bromochlorobenzene (21)	×											193, 177, 176
bromodichloromethane (22)	×	×	×		×	×	×	×	×	×	See List A.	188, 191, 192, 35, 194, 195, 108, 204, 203, 198, 13, 111, 209
bromoform (23)	×	×	×		×		×			×	See List B.	188, 191, 177, 194, 108, 203, 204, 209
bromoform butanal (24)					×							111
bromophenyl phenyl ether (25)	×											193, 177, 176
butyl benzene (26)	×											193, 177, 176
butyl bromide (27)					×							111
camphor (28)	×											177, 176
e-caprolactam (29)											Lawrence MA	206
carbon disulfide (30)	×	×					×					188, 209
carbon tetrachloride (31)	×	×			×		×		×	×	Cape Girardeau MO, Dayton OH, Huntington WV, Indianapolis IN, Oklahoma City OK, Passaic Valley NJ, Topeka KS, Waterbury CT, Wilmington DE	188, 35, 177, 108, 111, 204, 209
chlordane (32)	×					×						188, 198
chlorobenzene (33)	×	×			×		×			×		193, 177, 108, 111, 176, 209
1,2-bis-chloroethoxyethane (34)											Philadelphia (tentative)	190
b-chloroethyl methyl ether (35)		×										198, 204

APPENDIX D

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Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
chloroform (36)	x	x			x	x	x	x	x	x	See List C.	188, 192, 193, 35, 177, 195, 176, 207, 204, 198, 13, 108, 111, 194, 203, 209
chlorohydroxy benzophenone (37)			x									194, 203
bis-chloroisophropyl ether (38)	x		x								Brandenburg KY, Uniontown KY, Henderson KY	188, 194, 203, 199
chloromethyl ether (39)	x										[a]	177
chloromethyl ethyl ether (40)	x											176
m-chloronitrobenzene (41)	x											188, 177, 176
3-chloropyridine (42)	x											177, 176
o-cresol (43)												[b]
DDE (44)	x			x		x					Cedar Rapids IA, Oskaloosa IA, Waterloo IA, Iowa Falls IA, Sioux City IA, Fort Dodge IA, Davenport IA, Iowa City IA, Des Moines IA, Carville LA, Vicskburg MS[a], Cape Girardeau MO[a], Omaha NB[a], St. Louis MO[a], Burlington IA[a], Jefferson City MO[a]	188, 104, 198, 201[a]
DDT (45)	x					x					Carville LA, Vicksburg MS[a], Cape Girardeau MO[a], Omaha NB[a], Burlington IA[a], Jefferson City MO[a]	198, 201[a]
decane (46)	x				x							188, 111

APPENDIX D

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Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
dibromobenzene (47)	x											193, 177, 176
dibromochloromethane (48)	x	x	x		x	x	x	x	x	x	See List D.	188, 191, 192, 35, 194, 195, 108, 204, 203, 198, 209
dibromodichloroethane (49)	x											188
di-t-butyl—p-benzoquinone (50)	x											188
dibutyl phthalate (51)	x	x			x							188, 111, 33, 198, 204
1,4-dichlorobenzene (52)	x	x			x		x			x		188, 193, 177, 111, 176, 209
dichlorodifluoroethane (53)					x							111
1,2-dichloroethane (54)	x	x			x		x			x	See List E.	188, 193, 35, 177, 204, 209
dichloroethyl ether (55)	x		x							x	Brandenburg KY, Uniontown KY, Henderson KY	188, 190, 177, 194, 203, 176, 199, 209
dieldrin (56)	x	x				x[a]	x	x	x		Oskaloosa IA, Waterloo IA, Iowa Falls IA, Sioux City IA, Davenport IA, Iowa City IA, Des Moines IA, Carville LA, Vicksburg MS[a], Cape Girardeau MO[a], Omaha NB[a], St. Louis MO[a], Burlington IA[a], Jefferson City MO[a], several unspecified cities	188, 104, 8, 201[a], 209
diethyl phthalate (57)	x	x									Waterloo IA	188, 33, 198, 204
di(2-ethyl hexyl) phthalate (58)	x	x										188, 190, 33, 198, 204
dihexyl phthalate (59)	x											188
dihydrocarvone (60)	x											188
di-isobutyl carbinol (61)												b
di-isobutyl phthalate (62)	x											188

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
1,2-dimethoxybenzene (63)	x											177, 176
1,3-dimethyl naphthalene (64)	x											177
2,4-dimethyl phenol (65)												[b]
dimethyl phthalate (66)	x											177
dimethyl sulfoxide (67)	x											177
4,6-dinitro-2-aminophenol (68)												[b]
2,6-dinitrotoluene (69)	x											193, 177, 176
dioctyl adipate (70)	x						x				Pittsburgh PA	188, 192, 209
dipropyl phthalate (71)	x											188
docosane (72)		x										198, 204
n-dodecane (73)	x		x									188, 203
eicosane (74)		x										33, 198, 204
endrin (75)	x					x					Carville LA, Vicksburg MS[a], Cape Girardeau MO[a], Omaha NB[a], St. Louis MO[a]	188, 198, 201[a]
ethanol (76)	x	x						x	x	x	Pittsburgh PA	188, 192, 13, 198, 204, 209
ethylamine (77)					x							111
ethyl benzene (78)	x		x	x							Carville LA	188, 189, 193, 177, 194, 203, 176
2-ethyl-n-hexane (79)												[b]
cis-2-ethyl-4-methyl-1, 3-dioxolane (80)											Abbeville SC	199
trans-2-ethyl-4-methyl-1, 3-dioxolane (81)											Abbeville SC	199
o-ethyl toluene (82)	x										Pittsburgh PA	188, 192

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
guaiacol (83)	x											176 (dropped from 3/75 list)
heptachlor (84)						x^{a}					Carville LA^{a}, Vicksburg MS^{a}, several unspecified cities	8, 198, 201^{a}
heptachlor epoxide (85)						x					Carville LA^{a}, Vicksburg MS^{a}, Burlington IA^{a}	198, 201^{a}
1,2,3,4,5,7,7-heptachloronorbornene (86)	x											188
hexachlorobenzene (87)	x		x									193 (tentative), 177, 194, 203
hexachloro-1, 3-butadiene (88)	x											180
hexachlorocyclohexane (89)						x					Carville LA^{a}, Vicksburg MS^{a}, Cape Girardeau MO^{a}, Omaha NB^{a}, St. Louis MO^{a}, Burlington IA^{a}, Jefferson City MO^{a}	198, 201^{a}
hexachloroethane (90)	x		x				x					188, 194, 203, 209
hexadecane (91)		x										198, 204
2-hydroxyadiponitrile (92)											Lawrence MA	206
indene (93)				x								189
isodecane (94)					x							111
isophorone (95)	x	x										188, 209
isoborneol (96)	x											177, 176
isopropenyl-4-isopropyl benzene (97)	x											177
isopropyl benzene (98)	x			x								189, 193, 176
limonene (99)	x											188
methyl ester of lignoceric acid (100)		x										198

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
methane (101)											unspecified city	205
methanol (102)	x	x					x	x		x		188, 204, 209
2-methoxy biphenyl (103)												b
methyl benzoate (104)	x											188
methyl benzothiazole (105)											Philadelphia (tentative)	190
methyl biphenyl (106)	x											193, 177, 176
3-methyl butanal (107)	x	x					x		x	x		188, 204, 209
methyl chloride (108)	x	x					x		x	x		193, 177, 204, 176, 209
methyl ethyl ketone (109)	x	x			x			x	x	x	Bronson MI	188, 111, 204, 208, 209
2-methyl-5-ethyl-pyridine (110)												b
methyl indene (111)				x								189
methyl naphthalene (112)	x			x							Waterloo IA	188, 189, 190
methyl palmitate (113)		x									Waterloo IA	190, 33, 198, 204
methyl phenyl carbinol (114)												b
2-methyl propanal (115)	x	x					x	x	x	x		188, 204, 209
methyl stearate (116)		x										33, 198, 204
methylene chloride (117)	x	x			x		x	x	x	x	Pittsburgh PA, unspecified NW Georgia cities	188, 192, 108, 111, 198, 207, 209
naphthalene (118)	x		x	x	x						Waterloo IA	188, 189, 190, 111, 203
nitroanisole (119)												b, c
nitrobenzene (120)	x											193, 177, 176
nonane (121)	x				x							188, 111
octadecane (122)		x										33, 198, 204

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
octane (123)											Philadelphia PA (tentative)	190
octylchloride (124)					x							111
pentachlorobiphenyl (125)		x										198, 204
pentachlorophenol (126)											Corvallis OR	200
pentadecane (127)	x											188
pentane (128)											Philadelphia PA (tentative)	190
pentanol (129)					x							111
phenyl benzoate (130)		x										33, 198, 204
phthalic anhydride (131)		x										33, 198, 204
propanol (132)					x							111
propylamine (133)					x							111
propyl benzene (134)	x				x							177, 188, 108
1-terpineol (135)	x											177
1,1,3,3-tetrachloroacetone (136)		x										33, 198, 204
tetrachlorobiphenyl (137)		x										33, 198, 204
tetrachloroethane (138)	x				x							188, 111
tetrachloroethylene (139)	x	x	x		x	x				x		188, 35, 177, 194, 195, 108, 203, 176, 204, 209
tetradecane (140)	x											188
thiomethylbenzothiazole (141)											Philadelphia PA (tentative), unspecified NW Georgia cities	190, 207
toluene (142)	x	x	x		x		x	x		x	Carville LA, unspecified NW Georgia cities	188, 193, 177, 194, 108, 111, 176, 207, 203, 204, 209
trichlorobenzene (143)					x						unspecified NW Georgia cities	111, 207
trichlorobiphenyl (144)		x										198, 204

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part I: EPA Water Supply Division Listing as of 11/25/74

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
1,1,2-trichloroethane (145)	x						x	x				188, 177, 176, 209
1,1,2-trichloroethylene (146)	x	x					x	x		x	Bronson MI	188, 35, 204, 208, 209
trichlorofluoromethane (147)					x							111
2,4,6-trichlorophenol (148)		x										33, 198, 204
n-tridecane (149)	x											188
1,3,5-trimethyl-2,4,6-trioxo-hexahydro-triazene (150)	x											188
triphenyl phosphate (151)	x											188
n-undecane (152)	x											188
vinyl benzene (153)	x		x								Pittsburgh PA, Carville LA	912, 193, 177, 194, 203, 176
xylene (154)	x		x		x						Pittsburgh PA	188, 192, 194, 108, 111, 203

Part II: EPA Water Supply Division Additions as of 3/15/75

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
acenaphthene				x								189
benzaldehyde	x										Pittsburgh PA	188, 192
bladex	x											188
carbon dioxide					x							111
chlordene	x											188
1-chloropropene	x											35
crotonaldehyde											Pittsburgh PA	192
cyanogen chloride		x					x		x	x		204, 209
cycloheptanone												a
1,3-dichlorobenzene		x					x			x		209
1,1-dichloro-2-hexanone											Pittsburgh PA	192
2,4-dichlorophenol											Pittsburgh PA	192

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part II: EPA Water Supply Division Additions as of 3/15/75

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
dichloropropane	x											35
1,3-dichloropropene	x											35
di-(2-ethyl hexyl) adipate	x											188
diethyl benzene											Pittsburgh PA, Waterloo IA	190, 192
diphenyl hydrazine											Pittsburgh PA	192
m-ethyl toluene	x											188
p-ethyl toluene	x											188
geosmin											Auburn AL	199
hexachlorophene												d
o-methoxy-phenol	x											177
methyl methacrylate											Pittsburgh PA	192
methyl tetracosanoate		x										204
pentachlorophenyl methyl ether	x											188
piperidine				x								111
propazine	x											188
simazine	x											188
trimethyl benzene	x			x							Pittsburgh PA	188, 192, 108
3,5,5-trimethyl-bicyclo-(4,1,0)-heptene-2-one												d
o-xylene	x			x								188, 108
m-xylene	x			x								188, 108
p-xylene	x			x								188, 108

APPENDIX D
THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part III: Drinking Water Organics Reported in the Primary Literature

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
alachlor	x											188
butachlor	x											188
butyl octyl maleate	x											188
dicyclopentadiene	x											188
ethyl acetate	x											188
pentachloroethane	x											188
1,1,1-trichloropropane	x											188
1,2,3-trichloropropene	x											188
2,3-dihydroindene			x	x								189, 203
methyl-2,3-dihydroindene				x								189
methyl benzothiophene				x								189
tetrachlorophenol		x										33
ethyl hexanol											Waterloo IA	190
methyl cyclohexane											Waterloo IA	190
ethyl acetophenone											Waterloo IA	190
dimethoxy acetophenone											Waterloo IA	190
2,6-di-t-butyl-4-methylphenol											Waterloo IA	190
o-phenyl phenol											Waterloo IA	190
butyl benzene sulfonamide											Waterloo IA	190
tetramethyl benzene											Pittsburgh PA	192
isocyanic acid	x											193, 177, 176
trichloropropane	x											35
trichloropropene	x											35
dichloroiodomethane										x		202

APPENDIX D

THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Part III: Drinking Water Organics Reported in the Primary Literature

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
chloral						x						202
bis-(2-ethoxy ethyl) ether			x									203
bromomethane		x					x					204, 209
chloroethane		x					x			x		204, 209
chloropropane		x										204
acetylene chloride		x					x			x		204, 209
bromotrichloroethylene		x										204
isopropanol											unspecified NW Georgia cities	207
biphenyl											unspecified NW Georgia cities	207
chloroethyl ether	x											176
diethyl ether		x								x	Niles MI	208
vinyl chloride							x			x		209
acetylene bromide							x					209
1,2-dichlorobenzene		x					x			x		209
trimethyl isocyanurate		x										209
1,1-dichloroethane							x					209
chloropicrin		x										209
1,1-dichloroethylene		x					x			x		209
nitro methane		x								x		209
cis-1,2-dichloroethylene		x					x			x		209
dimethoxy methane										x		209
trans-1,2-dichloroethylene							x					209

APPENDIX D
THE NATIONWIDE OCCURRENCE OF ORGANIC COMPOUNDS IDENTIFIED IN DRINKING WATER

Compound	New Orleans LA	Cincinnati OH	Evansville IN	Ames IA	Washington DC	Kansas City KS & MO	Miami FL	Seattle WA	Ottumwa IA	Philadelphia PA	Others	Reference Numbers
phenyl acetic acid									x			209
2-methyl butyl nitrile		x					x			x		209
3-methyl-2-butanone									x			209
2-methyl propyl nitrile		x					x			x		209
dimethyl disulfide									x			209
nicotine							x					209
methyl formate								x				209
methyl acetate								x				209
methyl ether		x						x		x		209
Totals	119	66	18	13	37	15	39	17	19	37	Pittsburgh PA: 21	

Footnotes:

[a] The data in this reference was obtained during the early 1960's and may not reflect the present occurrence of these pesticides.

[b] These compounds are included in the EPA Water Supply Division Listing of Organic Compounds Identified in Drinking Waters, 11/25/74.

[c] Will be dropped from the June 1975 Water Supply Listing of Organic Compounds Identified in Drinking Water.

[d] Verfying references were not found in the primary literature; however, this is probably because the data reflect current investigative results.

[e] Reference 209 refers to an initial interim report released April 17, 1975 by EPA.

LIST A

Albuquerque, NM
Annandale, VA
Atlanta, GA
Baltimore, MD
Boston, MA
Brownsville, TX
Buffalo, NY
Camden, AR
Cape Girardeau, MO
Charleston, SC
Chattanooga, TN
Chicago, IL
Clarinda, IA
Cleveland, OH
Clinton, IL
Coalinga, CA
Columbus, OH
Concord, CA
Corvallis, OR
Dallas, TX
Davenport, IA
Dayton, OH
Denver, CO
Detroit, MI
Dos Palos, CA
Douglas, AK
Grand Forks, ND
Greenville,MS
Huntington, WV
Huron, SD
Idaho Falls, ID
Ilwaco, WA
Indianapolis, IN
Indian Hill Waterworks, OH
Jacksonville, FL
Lawrence, MA
Lincoln, NB
Logansport, LA
Los Angeles, CA
Memphis, TN
Milwaukee, WI
Mt. Clemens, MI
Nashville, TN
Newark, DE
Newport, RI
New York, NY
Oklahoma City, OK
Oshkosh, WI
Owensboro, KY
Passaic Valley, NJ
Phoenix, AZ
Piqua, OH
Pittsburgh, PA
Pueblo, CO
Rhinebeck, NY
Salt Lake City, UT
San Antonio, TX
San Diego, CA
San Juan, PR
Stillwater, OK
St. Louis, MO
St. Paul, MN
Terrebonne Parish, LA
Toms River, NJ
Topeka, KS
Tucson, AZ
Waterbury, CT
Wheeling, WV
Whiting, IN
Wilmington Sub., DE
Youngstown, OH

LIST B

Albuquerque, NM
Brownsville, TX
Charleston, SC
Coalinga, CA
Concord, CA
Dayton, OH
Dos Palos, CA
Greenville, MS
Huron, SD
Lincoln, NB
Logansport, LA
Newark, DE
Newport, RI
Oklahoma City, OK
Owensboro, KY
Phoenix, AZ
San Antonio, TX
San Diego, CA
San Francisco, CA
San Juan, PR
Stillwater, OK
St. Louis, MO
Terrebonne Parish, LA
Topeka, KS
Tucson, AZ
Waterbury, CT

LIST C

Albuquerque, NM
Annandale, VA
Atlanta, GA
Baltimore, MD
Boston, MA
Brownsville, TX
Buffalo, NY
Camden, AR
Cape Girardeau, MO
Charleston, SC
Chattanooga, TN
Chicago, IL
Clarinda, IA
Cleveland, OH
Clinton, IL
Coalinga, CA
Columbus, OH
Concord, CA
Corvallis, OR
Dallas, TX
Davenport, IA
Dayton, OH
Denver, CO
Detroit, MI
Dos Palos, CA
Douglas, AK
Grand Forks,ND
Greenville, MS
Huntington, WV
Huron, SD
Idaho Falls, ID
Ilwaco, WA
Indianapolis, IN
Indian Hill Waterworks, OH
Jacksonville, FL
Lawrence, MA
Lincoln, NB
Logansport, LA
Los Angeles, CA
Memphis, TN
Milwaukee, WI
Mt. Clemens, MI
Nashville, TN
Newark, DE
Newport, RI
New York, NY
Oklahoma City, OK
Oshkosh, WI
Owensboro, KY
Passaic Valley, NJ
Phoenix, AZ
Piqua, OH
Pittsburgh, PA
Pueblo, CO
Rhinebeck, NY
Salt Lake City, UT
San Antonio, TX
San Diego, CA
San Francisco, CA
San Juan, PR
St. Louis, MO
St. Paul, MN
Strasburg, PA
Terrebonne Parish, LA
Toms River, NJ
Topeka, KS
Tucson, AZ
Waterbury, CT
Wheeling, WV
Whiting, IN
Wilmington, DE
Youngstown, OH
unspecified NW Georgia cities

LIST D

- Albuquerque, NM
- Annandale, VA
- Atlanta, GA
- Baltimore, MD
- Brownsville, TX
- Buffalo, NY
- Camden, AR
- Cape Girardeau, MO
- Charleston, SC
- Chattanooga, TN
- Chicago, IL
- Clarinda, IA
- Cleveland, OH
- Coalinga, CA
- Columbus, OH
- Concord, CA
- Dallas, TX
- Davenport, IA
- Dayton, OH
- Denver, CO
- Detroit, MI
- Dos Palos, CA
- Douglas, AK
- Greenville, MS
- Huntington, WV
- Huron, SD
- Idaho Falls, ID
- Ilwaco, WA
- Indianapolis, IN
- Indian Hill Waterworks, OH
- Jacksonville, FL
- Lawrence, MA
- Lincoln, NB
- Logansport, LA
- Los Angeles, CA
- Memphis, TN
- Milwaukee, WI
- Mt. Clemens, MI
- Nashville, TN
- Newark, DE
- Newport, RI
- New York, NY
- Oklahoma City, OK
- Oshkosh, WI
- Owensboro, KY
- Passaic Valley, NJ
- Phoenix, AZ
- Piqua, OH
- Pittsburgh, PA
- Pueblo, CO
- Rhinebeck, NY
- Salt Lake City, UT
- San Antonio, TX
- San Diego, CA
- San Francisco, CA
- San Juan, PR
- Stillwater, OK
- St. Louis, MO
- St. Paul, MN
- Terrebonne Parish, LA
- Toms River, NJ
- Topeka, KS
- Tucson, AZ
- Waterbury, CT
- Wheeling, WV
- Wilmington, DE
- Youngstown, OH

LIST E

Buffalo, NY
Cape Girardeau, MO
Chattanooga, TN
Chicago, IL
Davenport, IA
Dayton, OH
Detroit, MI
Greenville, MS
Huntington, WV
Milwaukee, WI
Mt. Clemens, MI
Newark, DE
Oklahoma City, OK
Oshkosh, WI
Passaic Valley, NJ
Piqua, OH
Rhinebeck, NY
St. Louis, MO
Terrebonne Parish, LA
Waterbury, CT
Wheeling, WV
Wilmington Sub., DE

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ERRATA

The following changes should be made in Appendix C.

1. Data Display p. 53, Item B.2 should read "may result from chlorination of finished water; not formed in prior purification steps."

2. Data Display p. 53, Item C.2 should read "(Air) ethyl radical + chlorine + flourine → dichlorofluorethane + hydrogen flouride + hydrogen chloride. (Water) difluoroalkene + HOCl → dichlorodifluoroethane + water."

3. Data Display p. 147, Item B.2 should read "formed in small quantities during chlorination."

4. Data Display p. 147, Item C.2 should read "(Air) methyl radical + chlorine → trichloromethyl radical; trichloromethyl radical + fluorine → trichlorofluoromethane."

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